BID 2011-08 ADVERTISEMENT

OTSEGO COUNTY ANIMAL CONTROL FACILITY

INVITATION TO BID - BID 2011-08

Otsego County will receive sealed proposals from qualified bidders for the construction of a new Animal Control Facility to be located at 256 Fairview Road, Gaylord, Michigan.

There will be a Mandatory Pre-Bid Meeting conducted by the Owner and Architect/Engineer at 1:00 p.m., on Wednesday, April 27, 2011. The meeting will be held at the Otsego County Building, 225 West Main Street, Room 100, Gaylord, Michigan. Bidding requirements will be presented. Attendance by Contract Bidders is mandatory.

Sealed Proposals may be mailed or delivered in person to Otsego County care of John Burt, County Administrator, 225 West Main St., Room 203, Gaylord, MI 49735. Proposals must be received "prior" to 3:00 p.m. (local time) on Thursday, May 5, 2011. Proposals will be opened publicly and read aloud at the Otsego County Building Room, 225 West Main Street., Room 100, Gaylord, Michigan, 49735 immediately following closure of the Bidding Period. Otsego County will not consider or accept a bid received after the date and time specified for bid submission. All bids will be evaluated at a later date.

Otsego County intends to Award a Contract to a single Contractor for work of all trades. Overall administration of the project will be the responsibility of the Contractor.

Bidding documents will be available on or about April 11, 2011, and will be on file for inspection at the following locations:

Otsego County Administrator's Office, 225 West Main Street, Room 203, Gaylord, MI 49735
Builders Exchange, Traverse City, Grand Rapids, Lansing, and Saginaw
Construction Association of Michigan, Bloomfield Hills
CDC News Michigan, Vero Beach, FL
Construction News Corporation, Cleveland, OH
Reed Construction Data, Norcross, GA
McGraw Hill, F.W. Dodge, Lansing

Bidding Documents will be available to Bidders in electronic format (.pdf) free of charge. Email requests to tony@anthonyessonarchitect.com . Paper copies of Bidding Documents may be purchased from Traverse Reproduction & Supply Company; 1373 Barlow Street, Traverse City, MI 49686, telephone 231/947-6284, fax: 231/947-6552. Requests for paper copies of Bidding Documents shall be made to Traverse Reproduction and Supply Company as the address above. Each request should be accompanied by the Bidders name, mailing address, shipping address if different, telephone, fax, email address. Contact Traverse Reproduction & Supply Company for Document purchase pricing and shipping costs.

Bid Security in the amount of five percent (10%) of Base Bid shall accompany each Proposal in the form of a bid bond, cashiers check or money order **payable to Otsego County**. A personal or company check does not constitute a Bid Security.

Proposals shall be submitted on the Proposal Forms provided in the Bidding Documents and shall be completely filled in and executed in accordance with the Contract Documents.

The successful Bidder will be required to furnish surety bonds as stated in the Contract Documents.

Performance Bond (100%)
Labor and Material Payment Bond (100%)

The Owner reserves the right to reject any of or all Proposals, to accept other than a low bid, and to waive informalities, irregularities, and/or errors in Proposals, which they feel is in their best interest.

Bids may not be withdrawn for a period of thirty (30) days after the opening of the Bids.

BID 2011-08 ANIMAL CONTROL FACILITY
Project Manual

PROJECT MANUAL

for

Otsego County Animal Control Facility

PROJECT NO. 160-10

April 4, 2011

ANTHONY P. ESSON
ARCHITECT

PO Box 479; Gaylord, Michigan 49734

TELEPHONE: 989/732-0585 FAX: 989/732-2102

PROJECT DIRECTORY

Otsego County Animal Control Facility

Project No. 0160-10

Owner: Otsego County
225 West Main Street; Room 203
Gaylord, MI 49735
Contact: John M. Burt, County Administrator
Telephone: 989/731-7527
Fax: 989/731-7529

Architect: Anthony Esson, Architect

Mailing Address:
PO Box 479
Gaylord, MI 49734

Shipping Address:
2111 Forester Drive
Frederic, MI 49733

Contact: Anthony Esson, President
Telephone: 989/732-0585
Fax: 989/732-2102

Site/Civil Engineer

Wade Trim, Inc.
271 West McCoy Road (49735)
PO Box 618 (49734)
Gaylord, MI
Contact: Steve Wright, PE
Telephone: 989/732-3584
Fax: 989/732-6391

Mechanical/Electrical Engineer

JLK Engine ring
5766 Catawaba Court
Gaylord, MI 49735
Contact: Justin Kowatch, PE
Telephone: 989/448-4631

Owner's Technology Consultant:

Empiric Solutions, Inc.
PO Box 58
Petoskey, MI 49770-0058
Contact: Eric Seeley, President
Telephone: 231/348-1035
Fax: 231/348-1044

Anthony Esson, Architect
Gaylord, Michigan

Otsego County Animal Control Facility
Gaylord, Michigan

April 4, 2011

Project No. 160-10

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Anthony Esson, Architect
Gaylord, Michigan

Otsego County Animal Control Facility
Gaylord, Michigan

April 4, 2011

Project No. 0160-10

INVITATION TO BID – BID 2011-08

Otsego County will receive sealed proposals from qualified bidders for the construction of a new Animal Control Facility to be located at 256 Fairview Road, Gaylord, Michigan.

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Construction Association of Michigan, Bloomfield Hills
CDC News Michigan, Vero Beach, FL
Construction News Corporation, Cleveland, OH
Reed Construction Data, Norcross, GA
McGraw Hill, F.W. Dodge, Lansing

Bidding Documents will be available to Bidders in electronic format (.pdf) by download from the County's website free of charge. Visit www.otsegocounty.gov/animal-control-18/ to obtain electronic copies. Paper copies of Bidding Documents may be purchased from Traverse Reproduction & Supply Company; 1373 Barlow Street, Traverse City, MI 49686, telephone 231/947-6284, fax: 231/947-6552. Requests for paper copies of Bidding Documents shall be made to Traverse Reproduction and Supply Company as the address above. Each request should be accompanied by the Bidders name, mailing address, shipping address if different, telephone, fax, email address. Contact Traverse Reproduction & Supply Company for Document purchase pricing and shipping costs.

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Bids may not be withdrawn for a period of thirty (30) days after the opening of the Bids.

END OF INVITATION TO BID

AIA® Document A701™ – 1997

Instructions to Bidders

for the following PROJECT:
(Name and location or address)
Otsego County Animal Control Facility
Gaylord, Michigan

THE OWNER:
(Name, legal status and address)
Otsego County
225 W. Main Street; Room 203
Gaylord, MI 49735

THE ARCHITECT:
(Name, legal status and address)
Anthony Esson, Architect
PO Box 479
Gaylord, MI 49734

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, or in other Contract Documents are applicable to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment or labor for a portion of the Work.

§ 1.10 A Plan Holder is a person, firm, or entity, including designated plan rooms, that has obtained a set of Bidding Documents from the issuing office for use in preparation and submission of a Bid. Persons, firms, or entities that obtained Bidding Documents from a plan room, third party, or from any other than the issuing office are not Plan Holders.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 The Bidder by making a Bid represents that:

§ 2.1.1 The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

§ 2.1.2 The Bid is made in compliance with the Bidding Documents.

§ 2.1.3 The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.

§ 2.1.4 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 COPIES

§ 3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who ~~submit a bona fide Bid and~~ return the Bidding Documents in ~~good~~ good, unmarked condition

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within ten days after receipt of Bids. ~~The cost of replacement of missing or damaged documents will be deducted from the deposit.~~ A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.

§ 3.1.2 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the Advertisement or Invitation to Bid, or in supplementary instructions to bidders.

§ 3.1.3 Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

§ 3.1.4 The Owner and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

§ 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

§ 3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

§ 3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least seven days prior to the date for receipt of Bids.

§ 3.2.3 Interpretations, corrections and changes of the Bidding Documents will be made by Addendum. Interpretations, corrections and changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon them.

§ 3.2.4 The Architect has endeavored to prepare Bidding Documents without conflicts or inconsistencies, however, it shall be recognized by the Bidder that conflicts and inconsistencies in the Plans and Specifications do occur. As such, in the case of a conflict or inconsistency in the Plans or Specifications that affects the Bid price, the Bidder shall include and/or shall be deemed to have included the higher quantity or quality of Product or material, and/or more labor intensive or costly installation in the Bid.

§ 3.2.5 The Architect has endeavored to coordinate the various aspects of the project in preparation of the Bidding Documents, however, is shall be recognized by the Bidder that components of the Work of any one trade may be identified at various locations throughout the Bidding Documents. As such, the successful Bidder shall be responsible for the Work identified in the Contract Documents as a whole without regard to the specific location of the information within the Contract Documents.

§ 3.3 SUBSTITUTIONS

§ 3.3.1 The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

§ 3.3.2 ~~No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted.~~ Where the Bidding Documents stipulate a particular Product with a provision for substitutions, substitutions will be considered by the Architect/Engineer up to ten (10) days prior to receipt of bids. Proposer shall submit a written request for approval to the Architect including the name of the material, product and/or equipment proposed and a complete description of the ~~proposed substitution~~ proposal including drawings, product data, performance ~~and~~ test data, and other information necessary for an ~~evaluation. A~~ evaluation of the proposal. Proposer shall include a statement setting forth changes in other materials, ~~equipment or~~ products, equipment and/or other portions of the ~~Work, including~~ Work including any changes in the work of other ~~contracts~~ trades that incorporation of the proposed substitution would ~~require, shall be included.~~ require. The burden

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of proof of the merit of the proposed substitution is upon the proposer. The Architect's ~~decision of approval or disapproval of a~~ approval or disapproval of the proposed substitution shall be final.

§ 3.3.3 If the Architect approves a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

§ 3.3.4 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.3.5 Where Bidding Documents allow "or equal" Products, substitutions may be made at the Bidder's discretion. Products substituted shall provide equal function, performance, dimension, appearance and quality as provided by the specified product. The Architect reserves the right to reject substitutions not meeting criteria for equal function, performance, dimension, appearance and quality. In that event, Contractor will be required to provide products meeting equal function, performance, dimension, appearance and quality criteria at no additional cost to the Owner. Preapproval of products specified as "or equal" prior to the receipt of Bids is not required, and the Architect will not respond to requests for preapproval.

§ 3.3.6 Where the Bidding Documents stipulate a particular product with no provision for substitutions, substitution will not be considered. The Architect will not respond to requests for substitutions for products specified "no substitutions" or "substitutions not permitted".

§ 3.4 ADDENDA

§ 3.4.1 Addenda will be transmitted to all ~~who are~~ known Plan Holders by the issuing office to have received a complete set of Bidding Documents.

§ 3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

§ 3.4.3 Addenda will be issued no later than ~~four~~ three days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 PREPARATION OF BIDS

§ 4.1.1 Bids shall be submitted in duplicate on the forms included with the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

§ 4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change."

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall make no additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

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§ 4.2 BID SECURITY

§ 4.2.1 Each Bid shall be accompanied by a bid security in the form ~~and amount required if so stipulated in the Instructions to Bidders.~~ of a Bid Bond, Certified Check in the amount of 5% of the Base Bid Amount. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. The amount of the bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Section 6.2.

§ 4.2.2 If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

§ 4.2.3 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn or (c) all Bids have been rejected.

§ 4.3 SUBMISSION OF BIDS

§ 4.3.1 All copies of the Bid, the bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids. Bids received after the time and date for receipt of Bids will be returned unopened.

§ 4.3.3 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.4 Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

§ 4.4 MODIFICATION OR WITHDRAWAL OF BID

§ 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.

§ 4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

§ 4.4.3 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

§ 4.4.4 Bid security, if required, shall be in an amount sufficient for the Bid as resubmitted.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 OPENING OF BIDS

~~At the discretion of the Owner, if stipulated in the Advertisement or Invitation to Bid, the properly identified Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids may be made available to Bidders.~~Bids will be opened and read publically at the time and location stipulated in the Invitation to Bid.

§ 5.2 REJECTION OF BIDS

The Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

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§ 5.3 ACCEPTANCE OF BID (AWARD)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest qualified Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's own best interests.

§ 5.3.2 The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 CONTRACTOR'S QUALIFICATION STATEMENT

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request, a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

§ 6.2 OWNER'S FINANCIAL CAPABILITY

The Owner shall, at the request of the Bidder to whom award of a Contract is under consideration and no later than seven days prior to the expiration of the time for withdrawal of Bids, furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Unless such reasonable evidence is furnished, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 SUBMITTALS

§ 6.3.1 The Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, after notification of selection for the award of a Contract, furnish to the Owner through the Architect in writing:

- **.1** a designation of the Work to be performed with the Bidder's own forces;
- **.2** names of the manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work; and
- **.3** names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 BOND REQUIREMENTS

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds may be secured through the Bidder's usual sources.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 If the Owner requires that bonds be secured from other than the Bidder's usual sources, changes in cost will be adjusted as provided in the Contract Documents.

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§ 7.2 TIME OF DELIVERY AND FORM OF BONDS

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Both bonds shall be written in the amount of the Contract Sum.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.

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BID FORM - STIPULATED PRICE

BID 2008-11

To: Otsego County
c/o John M. Burt, County Administrator
225 W. Main Street; Room 203
Gaylord, Michigan 49735

Project: Otsego County Animal Control Facility
Project No. 0160-10

Date: _____

Submitted by:
(full name)

_____

(full address)

_____

_____

1. OFFER

Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by Anthony Esson, Architect dated April 4, 2011 for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the

Stipulated Sum of: $_____ (numerical)

$_____dollars in lawful (written) money of the United States of America.

- We have included the cost of Performance and Labor/Material Payment Bonds in the Bid.
- We have included, the required security deposit as required by the Instruction to Bidders.
- All applicable federal and/or State of Michigan taxes are included in the Bid Sum.
- We have included the costs of all required construction permits and inspections in the bid sum.

2. ACCEPTANCE

This offer shall be open to acceptance and is irrevocable for thirty days from the bid closing date.

If this bid is accepted by the Owner within the time period stated above, we will:

- Execute the Agreement within seven (7) days of receipt of Notice of Award.
- Furnish the required bonds within seven (7) days of receipt of Notice of Award in the form described in Supplementary Conditions.
- Commence work within seven (7) days after written Notice to Proceed.

If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the

required Bond(s), the security deposit shall be forfeited as damages to the Owner by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

3. CONTRACT TIME

If this Bid is accepted, we will complete the work in _____ (_____) calendar days from the date of commencement, but not later than the dates included in the Instructions to Bidders.

4. CHANGES TO THE WORK

When the Architect establishes that the method of valuation for Changes in the Work will be net cost plus a percentage fee in accordance with General Conditions, our percentage fee will be:

_____percent overhead and profit on the net cost of our own Work;

_____percent on the cost of work done by any Subcontractor.

5. ADDENDA

The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.

Addendum # _____ Dated _____

Addendum # _____ Dated _____

6. BID FORM SIGNATURE(S)

The Corporate Seal of

_____

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

_____

(Authorized signing officer Title)

(Seal)

_____

(Authorized signing officer Title)

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

END OF BID FORM - STIPULATED PRICE

AIA® Document A101™ – 2007

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the day of in the year
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Otsego County
225 W. Main Street; Room 203
Gaylord, MI 49735
Telephone Number: 989/731-7527
Fax Number: 989/731-7529

and the Contractor:
(Name, legal status, address and other information)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

AIA Document A201™–2007, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

for the following Project:
(Name, location and detailed description)

Otsego County Animal Control Facility
Gaylord, Michigan
Proposed New Animal Control Facility

The Architect:
(Name, legal status, address and other information)

Anthony Esson, Architect
PO Box 479
Gaylord, MI 49734
Telephone Number: 989/732-0585
Fax Number: 989/732-2102

The Owner and Contractor agree as follows.

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TABLE OF ARTICLES

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8 MISCELLANEOUS PROVISIONS

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10 INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.
(Insert the date of commencement if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)

If, prior to the commencement of the Work, the Owner requires time to file mortgages and other security interests, the Owner's time requirement shall be as follows:

§ 3.2 The Contract Time shall be measured from the date of commencement.

§ 3.3 The Contractor shall achieve Substantial Completion of the entire Work not later than ( ) days from the date of commencement, or as follows:
(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. If appropriate, insert requirements for earlier Substantial Completion of certain portions of the Work.)

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Portion of Work **Substantial Completion Date**

, subject to adjustments of this Contract Time as provided in the Contract Documents.
(Insert provisions, if any, for liquidated damages relating to failure to achieve Substantial Completion on time or for bonus payments for early completion of the Work.)

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

~~**§ 4.2** The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:~~
~~*(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)*~~

~~**§ 4.3** Unit prices, if any:~~
~~*(Identify and state the unit price; state quantity limitations, if any, to which the unit price will be applicable.)*~~

~~**Item**~~	~~**Units and Limitations**~~	~~**Price Per Unit ($0.00)**~~

~~**§ 4.4** Allowances included in the Contract Sum, if any:~~
~~*(Identify allowance and state exclusions, if any, from the allowance price.)*~~

~~**Item**~~	~~**Price**~~

ARTICLE 5 PAYMENTS

§ 5.1 PROGRESS PAYMENTS

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the last day of a month, the Owner shall make payment of the certified amount to the Contractor not later than the last day of the following month. If an Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner not later than Thirty (30) days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

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§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

.1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of Ten percent (10.00 %). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.9 of AIA Document A201™–2007, General Conditions of the Contract for Construction;

.2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less retainage of Ten percent (10.00 %);

.3 Subtract the aggregate of previous payments made by the Owner; and

.4 Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A201–2007.

§ 5.1.7 The progress payment amount determined in accordance with Section 5.1.6 shall be further modified under the following circumstances:

.1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work, retainage applicable to such work and unsettled claims; and
(Section 9.8.5 of AIA Document A201–2007 requires release of applicable retainage upon Substantial Completion of Work with consent of surety, if any.)

.2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 9.10.3 of AIA Document A201–2007.

§ 5.1.8 Reduction or limitation of retainage, if any, shall be as follows:
(If it is intended, prior to Substantial Completion of the entire Work, to reduce or limit the retainage resulting from the percentages inserted in Sections 5.1.6.1 and 5.1.6.2 above, and this is not explained elsewhere in the Contract Documents, insert here provisions for such reduction or limitation.)

The Owner shall retain 10% on completed work through Final Payment.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 FINAL PAYMENT

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Section 12.2.2 of AIA Document A201–2007, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

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ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 INITIAL DECISION MAKER

The Architect will serve as Initial Decision Maker pursuant to Section 15.2 of AIA Document A201–2007, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 BINDING DISPUTE RESOLUTION

For any Claim subject to, but not resolved by, mediation pursuant to Section 15.3 of AIA Document A201–2007, the method of binding dispute resolution shall be as follows:
(Check the appropriate box. If the Owner and Contractor do not select a method of binding dispute resolution below, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.)

[ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2007

[X] Litigation in a court of competent jurisdiction

[ ] Other *(Specify)*

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2007.

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2007.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2007 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

0% %

§ 8.3 The Owner's representative:
(Name, address and other information)

John Burt
225 W. Main Street; Room 203
Gaylord, MI 49735

§ 8.4 The Contractor's representative:

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(Name, address and other information)

§ 8.5 Neither the Owner's nor the Contractor's representative shall be changed without ten days written notice to the other party.

§ 8.6 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

§ 9.1.1 The Agreement is this executed AIA Document A101–2007, Standard Form of Agreement Between Owner and Contractor.

§ 9.1.2 The General Conditions are AIA Document A201–2007, General Conditions of the Contract for Construction.

§ 9.1.3 The Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

§ 9.1.4 The Specifications:
(Either list the Specifications here or refer to an exhibit attached to this Agreement.)
All dated April 4, 2011

Section	Title	Date	Pages
01010	Summary of Work		2
01019	Contract Considerations		3
01039	Coordination and Meetings		6
01300	Submittals		6
01400	Quality Control		4
01500	Temporary Controls		6
01600	Material and Equipment		4
01650	Starting of Systems		2
01700	Contract Closeout		4
03100	Concrete Formwork		3
03200	Concrete Reinforcement		3
03300	Cast-in-Place Concrete		11
03451	Architectural Precast Concrete		4
04100	Mortar and Masonry Grout		5
04300	Unit Masonry Systems		12
05311	Steel Floor Deck		3
05500	Metal Fabrications		4
05511	Metal Stairs		5
05520	Handrails and Railings		3

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06112	Framing and Sheathing	5
06114	Wood Blocking and Curbing	3
06193	Plate Connected Wood Trusses	6
06200	Finish Carpentry	6
06625	Solid Plastic Fabrications	3
07212	Board Insulation	3
07213	Batt Insulation	2
07214	Foam Insulation	4
07217	Blown Insulation	2
07240	Exterior Insulation and Finish Systems	6
07260	Vapor Retarders	2
07270	Air and Moisture Barriers	8
07311	Asphalt Shingles	4
07620	Sheet Metal Flashing and Trim	3
07900	Joint Sealers	6
08111	Standard Steel Doors	4
08112	Standard Steel Frames	4
08211	Flush Wood Doors	5
08305	Access Doors	2
08610	Wood Windows	4
08700	FRP Flush Doors and Aluminum Entrances	6
08710	Door Hardware	14
08800	Glazing	7
09212	Sprayed-on Acoustical Treatment (SATF)	3
09260	Gypsum Board Systems	5
09306	Floor Tile	6
09307	Wall Tile	5
09511	Suspended Acoustical Ceilings	4
09650	Resilient Flooring	4
09670	Fluid-Applied Flooring	4
09770	Special Wall Surfacing	4
09900	Painting	9
10105	Visual Display Boards	4
10441	Room Identification Signs	3
10522	Fire Extinguishers, Cabinets and Accessories	3
10800	Toilet and Bath Accessories	5
12300	Manufactured Casework	9
13190	Kennel Equipment	3
15010	General Mechanical and Plumbing Requirements	10
15075	Mechanical Identification	3
15082	Piping Insulation	5
15083	Piping Safety Covers	3

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15086	Duct Insulation		4
15128	Gages and Meters		2
15145	Plumbing Piping		10
15146	Plumbing Specialties		5
15410	Plumbing Fixtures		5
15430	Plumbing Equipment		3
15536	Forced Air Furnaces		5
15544	Fuel Fired Unit Heaters		3
15762	Terminal Heat Transfer Units		2
15810	Ducts		5
15820	Duct Accessories		3
15835	Power Ventilators		2
15850	Air Outlets and Inlets		2
15950	Testing, Adjusting, and Balancing		9
16010	General Electrical Requirements		8
16060	Grounding and Bonding		3
16070	Hangers and Supports		2
16075	Electrical Identification		2
16123	Low-Voltage Electrical Power Conductors and Cables		4
16131	Conduit		5
16138	Boxes		3
16140	Wiring Devices		6
16145	Lighting Control Devices		9
16155	Equipment Wiring		2
16210	Electrical Utility Services		2
16412	Enclosed Switches		4
16423	Enclosed Motor Controllers		3
16443	Panelboards		8
16491	Fuses		2
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§ 9.1.5 The Drawings:
(Either list the Drawings here or refer to an exhibit attached to this Agreement.)
All dated April 4, 2011

Number	Title	Date
T	Title Sheet and Building Information	
C-0.1	Civil Cover Sheet	
C-0.2	General Notes Plan	
C-1.0	Existing Conditions Plan	
C-2.0	SWPP Plan	
C-2.1	SWPP Details Plan	
C-3.0	Site Plan	
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ES-1.0	Electrical Site Plan	
L-1.0	Landscape Plan	
L-1.1	Landscape Details and Notes Plan	
A1.1	Floor Plan / Mezzanine Plan	
A2.1	Equipment Plan and Elevations	
A3.1	Reflected Ceiling Plan	
A4.1	Exterior Elevations	
A5.1	Room Finish Schedule / 1/4" Plans and Interior Elevations	

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A5.2	Door Schedule / Door & Frame Elevations and Details
A5.3	Head Jamb and Sill Details
A6.1	Building Sections
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A8.1	Roof Plan
S0.1	Structural Notes and Info
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S3.2	Roof truss Profiles
P1	Plumbing Plan – Below Grade
P2	Plumbing Plan – Above Grade
P3	Plumbing Details
P4	Plumbing Details
M1	Mechanical – HVAC Plan
M2	Mechanical Details
M3	Mechanical Details
M4	Mechanical Details
E1	Electrical – Lighting Plan
E2	Electrical – Power Plan
E3	Electrical Details
E4	Electrical Details

§ 9.1.6 The Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding requirements are not part of the Contract Documents unless the bidding requirements are also enumerated in this Article 9.

§ 9.1.7 Additional documents, if any, forming part of the Contract Documents:

~~**.1** AIA Document E201™–2007, Digital Data Protocol Exhibit, if completed by the parties, or the following:~~

.2 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201–2007 provides that bidding requirements such as advertisement or invitation to bid, Instructions to Bidders, sample forms and the Contractor's bid are not part of the Contract Documents unless enumerated in this Agreement. They should be listed here only if intended to be part of the Contract Documents.)

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Document	Date	Pages
Invitation to Bid	April 4, 2011	2
Instructions to Bidders – AIA A701-1997	April 4, 2011	7
Bid Form – Stipulated Price	May 5, 2011	3

ARTICLE 10 INSURANCE AND BONDS

The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A201–2007.

(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A201–2007.)

Type of insurance or bond	Limit of liability or bond amount ($0.00)
Performance Bond	100% of the Contract Amount
Labor and Material Payment Bond	100% of the Contract Amount
Worker's Compensation	Statutory
Comprehensive General Liability	
a. Bodily Injury	$ 1,000,000 Each Person / $ 1,000,000 Each Occurrence
b. Personal Injury	$ 1,000,000 Aggregate / $ 1,000,000 General Aggregate
Automobile General Liability	
a. Bodily Injury	$ 1,000,000 Each Person / $ 1,000,000 Each Occurrence
b. Property Damage	$ 1,000,000 Each Occurrence
Independent Contractors	Same limits as preceding
Products and Complete Operations	Same limits as preceding for One (1) Year commencing with issuance of final Certificate for Payment
Contractual Liability	Same limits as preceding

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
John Burt, Otsego County Adminstrator	
(Printed name and title)	*(Printed name and title)*

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AIA® Document A201™ – 2007

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)
Otsego County Animal Control Facility
Gaylord, Michigan

THE OWNER:
(Name, legal status and address)
Otsego County
225 W. Main Street; Room 203
Gaylord, MI 49735

THE ARCHITECT:
(Name, legal status and address)
Anthony Esson, Architect
PO Box 479
Gaylord, MI 49734

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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3 CONTRACTOR

4 ARCHITECT

5 SUBCONTRACTORS

6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

7 CHANGES IN THE WORK

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11 INSURANCE AND BONDS

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14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding requirements.

§ 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

§ 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 INSTRUMENTS OF SERVICE

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 CAPITALIZATION

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 INTERPRETATION

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the

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portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

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§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

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§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

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§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

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§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and

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completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 3.18.

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§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

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§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

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§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and
- **.2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the

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Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

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ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum; and
- **.3** The extent of the adjustment, if any, in the Contract Time.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon;
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- **.4** As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount

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for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and

.5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 PROGRESS AND COMPLETION

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

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§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or

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encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a separate contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

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§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 FAILURE OF PAYMENT

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 SUBSTANTIAL COMPLETION

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

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§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

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§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents; or
- **.3** terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

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§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY
If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 HAZARDOUS MATERIALS
§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

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§ 10.4 EMERGENCIES

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- **.1** Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- **.2** Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- **.3** Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- **.4** Claims for damages insured by usual personal injury liability coverage;
- **.5** Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- **.6** Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- **.7** Claims for bodily injury or property damage arising out of completed operations; and
- **.8** Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

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§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment

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property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

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ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

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§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by

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such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

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§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- **.1** that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- **.1** cease operations as directed by the Owner in the notice;
- **.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- **.3** except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

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ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- **.1** damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- **.2** damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

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§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

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§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 ARBITRATION

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 CONSOLIDATION OR JOINDER

§ 15.4.4.1 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.

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SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Description of Work

B. Contract Description.

C. Work by Owner.

D. Contractors Use of Site and Premises.

E. Future Work.

F. Work Sequence.

G. Salvaged Materials.

H. Conflicts and/or Inconsistencies in the Drawings and Specifications

1.2 DESCRIPTION OF WORK

A. The Work comprises general construction of a new Animal Control Facility including building and site work as described in the Plans and Specifications.

1.3 CONTRACT DESCRIPTION

A. Contract Type: Stipulated Price Agreement – AIA A101.

1.4 WORK BY OWNER

A. Items noted NIC (Not in Contract) or By Owner will be supplied and installed by the Owner and/or Owner's independent Contractor.

1.5 CONTRACTORS USE OF SITE AND PREMISES

A. Limit the use of the site and premises to allow for Work by Owner

B. Work areas shall be left in safe condition at the end of each work day, or during periods of inactivity.

C. Vehicular access to the site is limited to paved or gravel drives and parking areas. Vehicular access will not be permitted across lawn areas or concrete sidewalks. Coordinate site access with the Owner.

D. Maintain site means of egress during construction.

1.6 FUTURE WORK – Not Used

1.7 WORK SEQUENCE – Not used

1.8 SALVAGED MATERIALS – Not Used

1.9 CONFLICTS AND/OR INCONSISTENCIES IN THE DRAWINGS AND SPECIFICATIONS

A. The Architect has endeavored to prepare Contract Documents without conflicts or inconsistencies, however it shall be recognized by the Contractor that conflicts and inconsistencies in the Drawings and Specifications occur. As such, in case of a conflict or inconsistency in the Drawings or Specifications not brought to the Architects attention prior to Bidding, the Contractor shall have deemed to include the higher quantity or quality of material, or more labor intensive or costly installation in the Bid.

B. The Architect has endeavored to coordinate various aspects of the project in the preparation of the Contract Documents, however it shall be recognized by the Contractor that components of the work of any one trade may be identified at various locations throughout the Contract Documents. As such, the Contractor is responsible for the Work identified in the Contract Documents as a whole, irrespective of the specific locations of the information provided.

PART 1 PRODUCTS - Not Used

PART 2 EXECUTION - Not Used

END OF SECTION

SECTION 01019

CONTRACT CONSIDERATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cash Allowances.

B. Contingency Allowance.

C. Inspection and testing allowances.

D. Schedule of values.

E. Application for payment.

F. Change procedures.

G. Measurement and payment – unit prices.

H. Defect assessment.

I. Bid Alternates.

1.2 RELATED SECTIONS

A. Section 01300 - Submittals: Construction Progress Schedule.

1.3 CASH ALLOWANCES – Not Used

1.4 CONTINGENCY ALLOWANCE

A. A Contingency Allowance has been established by the Owner.

B. Funds will be drawn from the Owner's Contingency Allowance only by Change Order.

1.5 INSPECTION AND TESTING ALLOWANCE – Not Used

1.6 SCHEDULE OF VALUES

A. Submit a printed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.

B. Submit Schedule of Values within ten (10) days after date of Owner-Contractor Agreement or issuance of Notice to Proceed for approval by the Architect.

C. Format: Based on the Table of Contents of this Project Manual. Identify and list each major trade or division of work. Separate cost of material and labor to install as separate line item.

D. Revise schedule to include each approved Change Orders as a separate line item, with each Application For Payment.

1.7 APPLICATIONS FOR PAYMENT

A. Submit three copies of each application on AIA For G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet or approved Contractor's electronic media driven form, including three copies of all required supporting documentation.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

C. Payment Period: Beginning first day of the month through the last day of the month. Payment to the Contractor will be made within thirty days of receipt of a properly submitted and completed application by the Architect.

D. Submit a properly executed and certified sworn statement indicating all monies owed as of the date of application.

E. Submit fully executed waivers of lien for each subcontractor and supplier included on the sworn statement. Progress payments will not be made without verification of waivers for the full balance of the previous payment.

1.8 CHANGE PROCEDURES

A. The Architect/Engineer will advise of minor changes in the Work not involving an adjustment to contract sum/price or contract time as authorized in the General Conditions by issuing supplemental instructions in writing to the Contractor.

B. The Architect/Engineer may issue a Proposal Request or Bulletin which includes a detailed description of a proposed change with supplementary or revised drawings. Contractor will prepare and submit an estimate of cost within 14 days. Include in the estimate any change in contract time.

C. The Contractor may propose changes by submitting a Request for Change Order to the Architect/Engineer, describing the proposed change and its full effect on the work. Include a statement describing the reason for the change, and the effect on the contract sum/price and contract time with full documentation.

D. Stipulated Sum / Price Change Order: Based on Proposal Request and Contractor's price quotation or Contractor's request for a Change Order as approved by Architect/Engineer.

E. Construction Change Directive: Architect/Engineer may issue a directive, on AIA Form G713 Construction Change Directive signed by the Owner, instructing the Contractor to proceed with a change in the work, for subsequent inclusion in a Change Order. Document will describe changes in the work, and designate method of determining any change in contract sum/price or contract time. Promptly execute the changes.

F. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract. Architect/Engineer will determine the change allowable in contract sum/price and contract time as provided in the contract documents.

G. Maintain detailed records of work done on time and material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the work.

H. Change Order Forms: AIA G701 Change Order.

I. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

1.9 MEASUREMENT AND PAYMENT – UNIT PRICES – Not Used

1.10 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of the Architect/Engineer, it is not practical to remove and replace the Work, the Architect/Engineer will direct an appropriate remedy or adjust payment.

1.11 BID ALTERNATES (WHERE REQUESTED IN THE BIDDING DOCUMENTS)

A. Accepted Bid Alternates will be identified in Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work as required.

C. Required Bid Alternates: Required Bid Alternates may be accepted at the time of contract award.

D. Voluntary Bid Alternates: Voluntary Bid Alternates will not be considered as a basis for award of the contract. Voluntary Bid Alternates may however, be accepted at the time of contract award.

END OF SECTION

SECTION 01039

COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coordination and project conditions.

B. Field engineering.

C. Pre-construction meeting.

D. Site mobilization meeting.

E. Progress meetings.

F. Periodic construction visits.

G. Pre-installation meetings.

H. Project record documents.

I. Equipment electrical characteristics and components.

J. Acceptance of preceding work.

K. Cutting and patching.

L. Alteration project procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Coordinate space requirements, supports, and installation of mechanical and electrical Work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. In finished areas, conceal pipes, ducts, and wiring within the construction except where specifically indicated otherwise. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.

F. During Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.3 FIELD ENGINEERING

A. Employ a Land Surveyor registered in the Sate of Michigan and acceptable to the Architect.

B. Contractor shall locate and protect survey control and reference points.

C. Control datum for survey is that established by Owner provided survey.

D. Verify set-backs and easements; confirm drawing dimensions and elevations.

E. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

F. Submit a certificate signed by Land Surveyor that the elevations and locations of the Work are in conformance with the Contract Documents.

1.4 PRE CONSTRUCTION MEETING

A. Architect/Engineer will schedule a meeting after Notice of Award.

B. Attendance required: Owner, Architect and Contractor.

C. Agenda:

1. Execution of Owner-Contractor Agreement

2. Submission of executed Bonds and Insurance Certificates

3. Distribution of Contract Documents

4. Submission of Schedule of Values

5. Designation of personnel representing parties in Contract, and the Architect

6. Procedures for processing of field decisions, submittals, substitutions, applications for payment, proposal requests, Change Orders, and Contract closeout procedures

7. Scheduling

8. Use of premises by Owner and Contractor.

9. Owner’s requirements and partial occupancy.

10. Construction facilities and controls provided by the Owner.

11. Temporary utilities provided by the Owner.

12. Survey and building layout.

13. Security and housekeeping procedures.

14. Procedures for testing.

15. Procedures for maintaining record documents,

16. Requirements for start-up of equipment.

17. Inspection and acceptance of equipment put into service during construction period.

D. Contractor shall record minutes of the meeting and distribute copies within two days after the meeting to participants and those affects by decisions made.

1.5 SITE MOBILIZATION MEETING – Not Used

1.6 PROGRESS MEETINGS

A. The General Contractor shall schedule and administer meetings throughout progress of the Work at monthly intervals.

B. The General Contractor shall make arrangements for meetings, prepare agenda with copies for all participants, preside at meetings.

C. The General Contractor shall schedule meetings to coordinate with preparation of payment requests.

D. Attendance Required: Project Manager, On-site Supervisor, major Subcontractors and suppliers, Owner's Representative, Architect/Engineer, as appropriate to agenda topics for each meeting.

E. Agenda - should consist but not be limited to the following:

1. Review minutes of previous meetings.

2. Review of Work progress.

3. Field observations, problems, and decisions.

4. Identification of problems which impede planned progress.

5. Review of submittals schedule and status of submittals.

6. Review of off-site fabrication and delivery schedules.

7. Maintenance of progress schedule.

8. Corrective measures to regain projected schedules.

9. Planned progress during succeeding work period.

10. Coordination of projected progress.

11. Maintenance of quality and work standards.

12. Effect of proposed changes on progress schedule and coordination.

13. Other business relating to Work.

14. Coordination of work by Owner's Contractor with work of the General Contract.

15. Project Record Documents

F. Record minutes and distribute copies within two (2) days after meeting to participants, with one (1) copy each to Architect/Engineer, Owner's Engineer, Owner, participants, and those affected by decisions made.

1.7 PERIODIC CONSTRUCTION VISITS

A. The Architect and Owner will visit the project site periodically during construction. The purpose of the visits will be to monitor the progress and quality of the work.

B. Contractor's Project Manager and/or on site Superintendent shall be available to the Architect and Owner during periodic construction visits.

1.8 PRE-INSTALLATION MEETING

A. When required in individual specification sections, convene a pre-installation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect/Engineer four days in advance of meeting date.

D. Prepare agenda and preside at meeting:

1. Review conditions of installation, preparation and installation procedures.

2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with one copy to Architect, Owner, participants, and those affected by decisions made.

1.9 PROJECT RECORD DOCUMENTS

A. Contractor shall maintain and update Project Record Drawings (As-Built Drawings) on site during construction.

B. Project Record Documents shall be available for review by the Architect.

PART 2 PRODUCTS

2.1 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Motors: Refer to Division 15000, NEMA MG1 Type. Specific motor type is specified in individual specification sections.

B. Wiring Terminations: Provide terminal lugs to match branch circuit conductor qualities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.

C. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

PART 3 EXECUTION

3.1 ACCEPTANCE OF PRECEDING WORK

A. Before starting any operation, each Contractor(s) shall examine work performed by others to which their work adjoins or is applied and shall report to the Architect any conditions that will prevent satisfactory accomplishment of their work.

B. Failure to notify the Architect of deficiencies or faults in preceding work will constitute acceptance thereof and waive of any claims to its usability.

3.2 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements which affect:

1. Structural integrity of element.

2. Integrity of weather-exposed or moisture-resistant elements.

3. Efficiency, maintenance, or safety of element.

4. Visual qualities of sight exposed elements.

5. Work of Owner or separate Contractor.

C. Execute cutting, fitting, and patching to complete work, and to:

1. Fit the several parts together, to integrate with other work.

2. Uncover work to install or correct ill-timed work.

3. Remove and replace defective and non-conforming work.

4. Remove samples of installed work for testing.

5. Provide openings in elements of work for penetrations of mechanical and electrical work.

D. Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.

E. Cut masonry and concrete materials using masonry saw or core drill.

F. Restore work with new products in accordance with requirements of contract documents.

G. Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

I. Where patching masonry, remove face shell and install new masonry soap matching existing masonry material. Patching of masonry openings with mortar will not be accepted.

J. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

K. Identify hazardous substances or conditions exposed during the work to the Architect/Engineer for decision or remedy.

3.3 ALTERATION PROJECT PROCEDURES – Not Used

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures

B. Construction Progress Schedule

C. Proposed Products List

D. Product Data

E. Shop Drawings

F. Samples

G. Design data

H. Test reports

I. Certificates

J. Manufacturer's instructions

K. Manufacturer's field reports

L. Erection drawings

1.2 RELATED SECTIONS

A. Section 01400 - Quality Control: Manufacturers' field services and reports.

B. Section 01700 - Contract Closeout: Contract warranties, bonds, manufacturers' certificates, and closeout submittals.

1.3 SUBMITTAL PROCEDURES

A. Transmit each submittal with transmittal identifying Project, Contractor, Subcontractor or supplier, products submitted by name designated in specifications, and Specification section number.

B. Provide copies required by governing authorities which are in addition to copies specified for submittal to Architect/Engineer.

C. Apply Contractor's stamp, signed or initialed certifying that submittals have been reviewed for verification of Products required, field dimensions, adjacent construction Work, and coordination of information as required by the Work and Contract Documents.

D. Schedule submittals to expedite the Project, and deliver to Architect/Engineer at business address. Coordinate submission of related items.

E. For each submittal for review, allow fifteen (15) days excluding delivery time to and from the contractor. Submittals for longer lead time items shall be expedited by the Contractor in order to allow for the Owner's completion schedule. Notify Architect of longer lead time items requiring expedited review.

F. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

G. Provide space for Contractor and Architect/Engineer review stamps.

H. When revised for re-submission, identify all changes made since previous submission.

I. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

J. Submittals not requested will not be recognized or processed.

K. Where specified below, retain one copy of each submittal to be turned over to the Owner as record documentation in accordance with Section 01700.

L. Electronic Submittals: Architect will accept electronic submittals (.pdf format) of Product Data, Shop Drawings, Design Data, Test Reports, Certificates, Manufacturers Instructions, and Erection Drawings. Transmit electronic submittals with required transmittal form and Contractor's certification that submittals have been reviewed in accordance with 1.3.C above. Architect will return files electronically following review. Contractor shall distribute copies of reviewed submittals to appropriate parties. Contractor shall provide a paper copy of approved submittals to governing authorities upon request. Contractor shall provide a paper copy of approved submittals to the Owner as required by 1.3.K above.

1.4 CONSTRUCTION PROGRESS SCHEDULE

A. Submit initial schedule in duplicate within 7 days after notification to proceed.

B. Revise schedule and resubmit as required.

C. Submit revised schedules with each Application for Payment, identifying changes since previous version.

D. Utilize contractors standard computer generated schedule format.

E. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate early and late start, early and late finish, float dates, and duration.

F. Indicate estimated percentage of completion for each item of Work at each submission.

G. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by Allowances.

1.5 PROPOSED PRODUCTS LIST

A. Within 7 days of notice to proceed, submit a list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.6 PRODUCT DATA

A. Product Data For Review:

1. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

2. After review, provide copies and distribute in accordance with Submittal Procedures article above, and retain one copy to be turned over to the Owner in accordance with Section 01700.

B. Product Data For Information:

1. Submitted for the Architect/Engineer's knowledge as contract administrator or for the Owner.

C. Product Data For Project Close-out:

1. Submitted for the Owner benefit during and after project completion.

D. Submit the number of copies required by the Contractor plus one (1) copy which will be retained by the Architect, plus (1) copy of all MEP submittals that will be retained by the Engineer, and one copy that will be turned over to the Owner.

E. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

F. Indicate Product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

G. After review distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 01700 - Contract Closeout.

1.7 SHOP DRAWINGS

A. Shop Drawings For Review:

1. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

2. After review, produce copies and distribute in accordance with Submittal Procedures article above and retain one copy to be turned over to the Owner in accordance with Section 01700.

B. Shop Drawings For Information:

1. Submitted for the Architect/Engineer's knowledge as contract administrator or for the Owner.

C. Shop Drawings For Project Close-out:

1. Submitted for the Owner benefit during and after project completion.

2. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Submit the number of copies required by the Contractor plus one (1) copy which will be retained by the Architect, plus (1) copy of all MEP submittals that will be retained by the Engineer and one copy that will be turned over to the Owner.

1.8 SAMPLES

A. Samples For Review:

1. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

B. Samples For Information:

1. Submitted for the Architect/Engineer's knowledge as contract administrator or for the Owner.

C. Samples For Selection:

1. Submitted to Architect/Engineer for aesthetic, color, or finish selection.

2. Submit samples of finishes from the full range of manufacturers' colors, textures, and patterns for Architect/Engineer selection as specified.

3. Architect/Engineer will provide color schedule indicating selected colors and finishes. Contractor shall duplicate and distribute in accordance with submittal procedure article above.

D. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

E. Include identification on each sample, with full Project information.

F. Samples for Selection are to be submitted in duplicate which will be retained by Architect/Engineer

G. Submit (1) sample for other purposes, which shall be retained by the Architect.

H. Samples will not be used for testing purposes unless specifically stated in the specification section.

1.9 DESIGN DATA

A. Submit for the Architect/Engineer's knowledge as contract administrator or for the Owner.

B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.10 TEST REPORTS

A. Submit for the Architect/Engineer's knowledge as contract administrator or for the Owner.

B. Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.11 CERTIFICATES

A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor, or the Contractor to Architect/Engineer, in quantities specified for Product Data.

B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect/Engineer.

1.12 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect/Engineer for delivery to owner in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

C. Refer to Section 01400 - QUALITY CONTROL, Manufacturers' Field Services article.

1.13 MANUFACTURER'S FIELD REPORTS

A. Submit reports for the Architect/Engineer's benefit as contract administrator or for the Owner.

B. Submit report in duplicate (2) within thirty (30) days of observation to Architect/Engineer for information.

C. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.14 ERECTION DRAWINGS

A. Submit drawings for the Architect/Engineer's benefit as contract administrator or for the Owner.

B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by the Architect/Engineer or Owner.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality assurance - control of installation.

B. Tolerances

C. References and standards.

D. Mock-up

E. Manufacturers' field services.

F. Inspecting and testing laboratory services

G. Examination and preparation.

H. Environmental conditions.

1.2 RELATED SECTIONS

A. Section 01300 - Submittals: Submission of manufacturers' instructions and certificates.

B. Section 01500 - Construction Facilities and Temporary Controls: Controls and utilities to maintain environmental conditions.

C. Section 01600 - Material and Equipment: Requirements for material and product quality.

1.3 QUALITY ASSURANCE - CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement. The use of wood or plastic plugs is prohibited.

1.4 TOLERANCES

A. Monitor fabrication and installation tolerance control of Products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

C. Adjust Products to appropriate dimensions; position before securing in place.

1.5 REFERENCES AND STANDARDS

A. For products or workmanship specified by association, trade or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date of Contract Documents except where a specific date is established by code.

C. Obtain copies of standards where required by product specification sections.

D. Neither the contractual relationship, duties or responsibilities of the parties in contract, nor those of the Architect/Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.6 MOCK-UP – Not Used

1.7 TESTING SERVICES

A. Owner will appoint, employ, and pay for specified services of an independent firm to perform testing.

B. The independent firm will perform tests and other services specified in individual specification sections and as required by the Architect/Engineer, Owner, and/or Authority Having Jurisdiction.

C. Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the Architect/Engineer or the Owner.

D. Reports will be submitted by the independent firm to the Architect/Engineer, Owner, and Contractor, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.

1. Notify independent firm 24 hours prior to expected time for operations requiring testing.

2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

F. Testing does not relieve Contractor to perform Work to contract requirements.

G. Re-testing required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Architect/Engineer. Payment for re-testing will be charged to the Contractor by deducting testing charges from the Contract Sum/Price.

1.8 INSPECTION SERVICES

A. Owner will appoint, employ, and pay for specified services of an independent firm to perform inspection.

B. The independent firm will perform inspections and other services specified in individual specification sections and as required by the Architect/Engineer, Owner, and Authority Having Jurisdiction.

C. Inspecting may occur on or off the project site. Perform off-site inspecting as required by the Architect/Engineer or the Owner.

D. Reports will be submitted by the independent firm to the Architect/Engineer, Owner, and Contractor, indicating compliance or non-compliance with Contract Documents.

E. Cooperate with independent firm; furnish safe access and assistance by incidental labor as requested.

1. Notify independent firm 24 hours prior to expected time for operations requiring inspection.

F. Inspecting does not relieve Contractor to perform Work to contract requirements.

1.9 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect/Engineer thirty (30) days in advance of required observations. Observer subject to approval of Architect/Engineer and/or Owner.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Refer to Section 01300 - SUBMITTALS, MANUFACTURERS' FIELD REPORTS article.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work constitutes acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

D. Strictly adhere to manufactures printed instructions and recommendations for substrate preparation. Where manufacturers printed instructions and/or recommendations conflict with information contained in Contract Documents, notify Architect prior to proceeding with work.

3.3 ENVIRONMENTAL CONDITIONS

A. Maintain environmental conditions during installation of work in accordance with manufacturer's instructions.

B. Maintain temporary controls as required to maintain environmental conditions under provisions of Section 01500.

C. Provide temporary utilities as required to maintain environmental conditions under provisions of Section 01500.

D. Refer to individual specification sections for specific environmental requirements.

E. Where specified or required, maintain environmental conditions until permanent controls are provided.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, cooling, ventilation, telephone service, facsimile service, email service, water, and sanitary facilities.

B. Temporary Controls: Barriers, enclosures and fencing, and protection of the work.

C. Construction Facilities: Parking, progress cleaning, and temporary buildings.

1.2 RELATED SECTIONS

A. Section 01039 – Coordination and Meetings

B. Section 01400 – Quality Control

C. Section 01700 – Contract Closeout: Final cleaning.

1.3 TEMPORARY ELECTRICITY

A. Cost: Owner will pay cost of energy used. Exercise measures to conserve energy.

B. Coordinate with utility and arrange for service installation.

C. Provide temporary feeders from service.

D. Compliment power service capacity and characteristics as required.

E. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.

F. Provide main service disconnect and over-current protection at convenient location.

G. Permanent convenience receptacles may be utilized during construction.

H. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1. Provide 20 ampere duplex outlets, single phase circuits for power tools as required.

2. Provide 20 ampere, single phase branch circuits for lighting.

1.4 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft.

B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.

C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

D. Maintain lighting and provide routine repairs.

E. Permanent building lighting may be utilized during construction.

1.5 TEMPORARY HEATING

A. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.

B. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

C. Where newly installed or renovated equipment is used for temporary heating, extend equipment warranty such that the manufacturer's warranty period is measured beginning on the date of Substantial Completion.

D. Replace all filters on newly installed or renovated equipment used for temporary heating at Substantial Completion.

E. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress. Where individual specification sections require higher temperature, maintain required temperature for the duration indicated in the individual specification sections.

1.6 TEMPORARY COOLIING

A. Provide and pay for cooling devices and cooling as needed to maintain specified conditions for construction operations.

B. Prior to operation of permanent equipment for temporary cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

C. Where newly installed or renovated equipment is used for temporary cooling, extend equipment warranty such that the manufacturer's warranty period is measured beginning on the date of Substantial Completion.

D. Replace all filters on newly installed or renovated equipment used for temporary cooling at Substantial Completion.

E. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress. Where individual specification sections require lower temperature, maintain required temperature for the duration indicated in the individual specification sections.

1.7 TEMPORARY VENTILATION

A. Provide and pay for ventilation devices and ventilation as needed to maintain specified conditions for construction operations.

B. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

C. Where newly installed or renovated equipment is used for temporary ventilation, extend equipment warranty such that the manufacturer's warranty period is measured beginning on the date of Substantial Completion.

D. Replace all filters on newly installed or renovated equipment used for temporary ventilation at Substantial Completion.

1.8 TELEPHONE SERVICE

A. Provide, maintain, and pay for telephone service to field personnel at time of project mobilization.

1.9 FACSIMILE SERVICE

A. Provide, maintain and pay for facsimile service and a dedicated telephone line to field office at time of project mobilization.

1.10 EMAIL SERVICE

A. Provide, maintain and pay for email service to site Superintendent and Project Manager at time of project mobilization.

1.11 TEMPORARY WATER SERVICE

A. Provide and pay for suitable quality water service for construction operations as required.

B. Extend branch piping with outlets located so water is available by hoses with threaded connections.

1.12 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

1.13 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owners use of site, and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide barriers to separate construction areas from adjacent occupied areas. Maintain barriers at the end of each work day, and during periods of inactivity.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.14 FENCING – Not used

1.15 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintin

pumping equipment as required.

B. Protect site from puddling or running water. Provide water barricades as required to protect site from soil erosion and to control sediment, and as required by Soil Erosion / Sedimentation Control Authority Having Jurisdiction.

1.16 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons.

B. Provide temporary roofing as specified in individual specification sections.

1.17 INTERIOR ENCLOSURES – Not used

1.18 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

1.19 SECURITY

A. Provide security and facilities to protect construction areas from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.20 ACCESS ROADS

A. Construct and maintain temporary roads accessing public thoroughfares to serve construction traffic.

B. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing rocks, mud, soil and debris from vehicle wheels, excavating equipment, and trailers before entering streets.

E. Designated existing on-site roads may be used for construction traffic.

1.21 PARKING

A. Park in Owner's existing lot.

B. When site space is not adequate, arrange and provide additional off-site parking.

1.22 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.23 PROJECT IDENTIFICATION

A. Provide 8 feet wide x 4 feet high project sign of exterior grade plywood and wood frame construction, painted, with exhibit lettering by professional sign painter or die cut vinyl, self-adhesive letters and painted or self-adhesive corporate logo, to Architects design and colors.

B. List title of Project, names of Owner, Architect/Engineer, professional subconsultants, Contractor, and major Subcontractors.

C. Erect sign on site. Coordinate location with Owner and Architect prior to erection.

D. No other signs are allowed without the Owner's permission except those required by law.

1.24 FIELD OFFICES AND SHEDS

A. Office: Weather tight , with lighting, electrical outlets, heating, cooling, and ventilating equipment, and equipped with sturdy furniture and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 8 persons.

C. Locate offices and sheds a minimum distance of 30 feet from existing and new structures, in location approved by the Owner.

1.25 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Transportation and handling.

C. Storage and protection.

D. Product options.

E. Substitutions.

1.2 RELATED SECTIONS

A. Instructions to Bidders – AIA Document A701-1997: Product-Assembly/System Substitutions.

B. Section 01400 - Quality Control: Product quality monitoring.

1.3 PRODUCTS

A. Do not install materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

B. Provide interchangeable components of the same manufacture for components being replaced.

1.4 TRANSPORTATION AND HANDLING

A. Transport and handle Products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.

C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.5 STORAGE AND PROTECTION

A. Store and protect Products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive Products in weather tight, climate controlled, enclosures in an environment favorable to Product.

D. For exterior storage of fabricated Products, place on sloped supports above ground.

E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

F. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of Products.

G. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

1.6 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with an “Or Equal” provision: Any Product meeting the quality standards or description. Pre-bid requests for approval of Products specified with an “or equal” provision will not be acknowledged. Acceptability of “or equal” Products will be determined by the Architect during the submittal process based upon the quality or suitability of the Product proposed.

D. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

1.7 PRE-BID SUBSTITUTIONS

A. Submit requests for substitutions under provisions of Instruction to Bidders – AIA Document 701-1997.

B. Requests for substitutions must be received by the Architect not later than seven days prior to the bid date. Requests received thereafter will not be considered

1.8 POST-BID SUBSTITUTIONS

A. Product or System substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.

B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

C. A request constitutes a representation that the Contractor:

1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.

2. Will provide the same warranty for the Substitution as for the specified Product.

3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension which may subsequently become apparent.

5. Will reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities.

D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

E. Substitution Submittal Procedure:

1. Submit three (3) copies of request for Substitution for consideration. Limit each request to one proposed Substitution.

2. Submit shop drawings, product data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.

3. The Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS

2.1 NAMEPLATES

A. Where indicated or needed for operation and maintenance provide permanent nameplates on equipment located in inconspicuous areas, and containing suitable information and operational data. Otherwise, do not allow manufacturer's trademarks or similar labels or nameplates to be placed on products in locations where exposed to view after installation.

2.2 ACCESS PANELS

A. Contractor installing such items as valves, air vents, cleanouts and anything requiring cleaning, adjustment or inspection, shall furnish and arrange to have installed metal access panels with hinge and slotted screw fasteners, where finished work covers such equipment.

B. This provision shall be construed to cover those conditions where access panels are required in addition to those shown or noted on the drawings.

C. Panels shall be fire rated and labeled when so required.

2.3 EXPANSION AND TOGGLE BOLTS

A. Where necessary to make attachment of any material, fixture or equipment which may be bolted to masonry or concrete walls, floors or ceilings, all Contractors shall, whenever possible, properly embed bolts in masonry or concrete for such attachments.

B. Where imbedding is not practical all contractors shall use suitable expansion devices or toggle bolts where hollow concrete masonry units (CMU) prevent any other fastening as required or recommended by the manufacturer of the product, material or equipment.

C. Use of wood or plastic plugs is prohibited.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS/INSTALLATION

A. When the Contract Documents require that installations comply with manufacturer's printed instructions - obtain and distribute copies of such instructions to parties involved in the installation, including two (2) copies to the Architect/Engineer.

B. Maintain one (1) set of complete instructions at the site during installation until completion.

C. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.

1. Should job conditions or specified requirements conflict with manufacturer's instructions consult the Architect/Engineer for further instructions.

D. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by the contract documents.

END OF SECTION

SECTION 01650

STARTING OF SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Starting systems.

B. Demonstration and instructions.

C. Testing, adjusting, and balancing.

1.2 RELATED SECTIONS

A. Section 01400 - Quality Control: Manufacturers field reports.

B. Divisions 15 and 16: System commissioning.

C. Section 01700 - Contract Closeout: System operation and maintenance data and extra materials.

1.3 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect/Engineer and Owner ten (10) working days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable manufacturer's representative if required or specified, Contractors' personnel in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report in accordance with Section 01300 and Divisions 15 and 16 requirements that equipment or system has been properly installed and is functioning correctly.

1.4 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel one (1) week prior to date of Substantial Completion.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at designated location.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

F. The amount of time and personnel required for instruction on each item of equipment and system is that specified in individual sections.

1.5 TESTING, ADJUSTING, AND BALANCING

A. Testing, adjusting, and balancing requirements are specified in individual specification sections. Sub-contractor shall include testing, adjusting, and balancing services as part of their sub-contract as defined in these specifications.

B. Reports will be submitted by the Contractor to the Architect/Engineer indicating observations and results of tests and indicating compliance or non-compliance with the requirements of the Contract Documents.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closeout procedures.

B. Punch List procedures.

C. Final cleaning.

D. Adjusting.

E. Project record documents.

F. Operation and maintenance data.

G. Extra materials, spare parts and maintenance Products.

H. Warranties and bonds.

I. Maintenance service.

1.2 RELATED SECTIONS

A. Section 01500 -Construction Facilities and Temporary Controls.

1.3 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected by authorities having jurisdiction, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's review.

B. Submit Contractors list of items remaining to be completed or corrected for final completion. Architect will utilize Contractor’s list as the basis for the final Punch List.

C. Provide submittals to Architect/Engineer that are required by governing or other authorities.

D. Submit Project Record Documents, Operation and Maintenance Data, and Warranties to the Architect for approval.

E. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.4 PUNCH LIST PROCEDURES

A. Upon written certification that the Work is substantially complete, approved by authorities having jurisdiction, and upon receipt of the Contractor’s list of items to be completed or corrected for final completion, the Architect (and Owner) will visit the site and prepare a written Punch List of items to complete for final acceptance of the Work.

B. Upon completion of all items on the Punch List, certify to the Architect in writing that all items have been completed and that the project is ready for final inspection. The Architect will visit the site and verify that all items have been satisfactorily corrected.

C. The Contractor shall reimburse the Owner for all costs incurred for each re-inspection by the Architect resulting from the Contractor's failure to correct all items indicated on the Punch List. Charges to the Contractor shall be made at such times and in such amounts as the Architect invoices the Owner under the current rate schedule in affect at the time of service. Such charges to the Contractor will be deducted from the Contractor's progress payment or final payment as applicable.

1.5 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.6 ADJUSTING

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.7 PROJECT RECORD DOCUMENTS

A. Maintain one set of the following record documents; record actual revisions to the Work:

1. Drawings.

2. Specifications.

3. Addenda.

4. Change Orders and other modifications to the Contract.

5. Approved Shop Drawings and Product Data.

6. Manufacturer's instruction for assembly, installation, and adjusting.

7. Field Test Records

8. Written instructions

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:

1. Manufacturer's name and product model and number.

2. Product substitutions or alternates utilized.

3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

2. Field changes of dimension and detail.

3. Details not on original Contract drawings.

G. Submit documents to Architect/Engineer with Operation and Maintenance Data.

1.8 OPERATION AND MAINTENANCE DATA

A. Submit data bound in 8-1/2 x 11 inch text pages, three D side ring binders with durable plastic covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project.

C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed on 20 pound white paper, in three parts as follows.

1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.

2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

a. Significant design criteria.

b. List of equipment.

c. Parts list for each component.

d. Operating instructions.

e. Maintenance instructions for equipment and systems.

f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:

a. Shop drawings and product data.

b. Air and water balance reports.

c. Certificates.

d. Photocopies of warranties and bonds.

E. Submit 1 draft copy of completed volumes 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect/Engineer comments. Revise content of all document sets as required prior to final submission.

F. Submit two sets of revised final volumes, within 10 days after final inspection.

1.9 EXTRA MATERIALS, SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide extra materials, spare parts, and maintenance products in quantities specified in individual specification sections.

B. Deliver to Project site and place in location as directed by School Maintenance Staff.

C. Submit copy of material transmittal with Owner's signature indicating acceptance of materials with close-out documents. Indicate type and quantity of materials delivered.

1.10 WARRANTIES AND BONDS

A. Provide notarized copies.

B. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.

C. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.

D. Include in Operation and Maintenance Manuals.

E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

1.11 MAINTENANCE SERVICE

A. Furnish service and maintenance of components indicated ion specification sections for period of time indicated in individual specification sections. Maintenance period shall begin on the date of substantial completion.

B. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

D. Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Owner.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION – Not Used

END OF SECTION

SECTION 03100

CONCRETE FORMWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 03300 - Cast-in-Place Concrete.

C. Section 03300 - Cast-In-Place Concrete: Supply of concrete accessories for placement by this section.

D. Section 31 1315 – Sidewalks and Driveways.

1.3 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ACI 347 - Recommended Practice For Concrete Formwork.

1.4 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.5 QUALITY ASSURANCE

A. Maintain quality under provisions of Section 01400.

B. Perform Work in accordance with ACI 347.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable codes for design, fabrication, erection and removal of formwork.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

A. Plywood: Douglas Fir species; factory coated grade; sound undamaged sheets with clean, true edges.

B. Lumber: SPF species; Construction grade; with grade stamp clearly visible.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine work under provisions of Section 01400.

B. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.2 EARTH FORMS

A. Earth forms are not permitted.

3.3 ERECTION – FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval before framing openings in structural members which are not indicated on Drawings.

F. Coordinate this section with other sections of work which require attachment of components to formwork.

G. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

H. Exposed corners and edges shall have 1x1 - 45 degree chamfers unless otherwise indicated on the drawings. Place chamfer strips to provide neat uniform appearance.

3.4 APPLICATION - FORM RELEASE AGENT

A. Manufacturer: Similar or equal to Duogard Plus as manufactured by W.R. Meadows, Elgin Illinois.

B. Apply form release agent on form work in accordance with manufacturer's recommendations.

C. Apply prior to placement of reinforcing steel, anchoring devices and embedded items.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items which will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.

D. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.

3.6 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.7 FORMWORK TOLERANCES

A. Maintain quality under provisions of Section 01400.

B. Construct formwork to maintain tolerances required by ACI 301.

3.8 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 03100 - Concrete Formwork.

C. Section 03300 - Cast-in-Place Concrete.

D. Section 04300 - Unit Masonry Systems

1.3 REFERENCES

A. ACI 318 - Building Code Requirements For Reinforced Concrete.

B. ASTM A82 - Cold Drawn Steel Wire for Concrete Reinforcement.

C. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

D. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

E. AWS D12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction.

F. CRSI - Concrete Reinforcing Steel Institute - Manual of Practice.

1.4 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate bar sizes, grades, spacings, locations, layouts, and quantities of reinforcing steel and wire fabric, bending and cutting schedules, and supporting and spacing devices.

1.5 SUBMITTALS FOR INFORMATION

A. Submit under provisions of Section 01300.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Submit certified copies of mill test report of reinforcement materials analysis.

1.6 QUALITY ASSURANCE

A. Maintain quality with provisions of Section 01400.

B. Perform Work in accordance with ACI 318.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars, unfinished.

B. Dowels: ASTM A615, 60 KSI yield grade; plain billet steel bars, unfinished.

C. Stirrup Steel: ASTM A82, unfinished.

D. Welded Steel Wire Fabric: ASTM A185, 6x6 – W2.9 x W2.9 Plain Type in flat sheets unfinished unless noted otherwise in plans.

2.2 ACCESSORIES

A. Tie Wire: ASTM A82, 16 gage minimum size.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions unless otherwise indicated.

1. For reinforcing on grade use supports with sand plates or horizontal runners where base material will not support chair.

2. For footings, trench footings and grade beams, use precast concrete bricks (f'_c = 3000 psi min. @ 28 days) or support from above. Concrete masonry units are not acceptable.

3. For CMU bond beams use #2 bar laterally tied to each longitudinal bar below to support and space longitudinal bars. Place #2 supports at 48 inches o.c. maximum.

C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel type; size and shape as required.

2.3 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI Manual of Practice.

B. Weld reinforcement in accordance with AWS D12.1.

C. Locate reinforcing splices not indicated on drawings, at point of minimum stress. Review location of splices with Architect/Engineer.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position or other unacceptable material.

1. Do not use brick, CMU, wood, rock, dirt or other unacceptable material for reinforcing support.

B. Do not displace, damage or penetrate vapor barrier / waterproofing.

C. Accommodate placement of formed openings.

D. Minimum Cover: Shall be the clear cover of concrete over the reinforcement, and shall be as follows:

1. Concrete Cast against Earth: 3 inches.

2. Formed Concrete Surface Exposed to Earth, Weather or Water: 2 inches.

3. Formed Concrete Surfaces of Walls, Beams and Columns Not Exposed to Earth, Weather or Water, or Exposed Slabs: 1 1/2 inches.

4. Slabs Not Exposed and Other Surfaces Not Noted: 1 inch.

E. The contract plans indicate in general the size and spacing of the required reinforcing steel. The fabrication or shop drawings shall detail all bars and placement to carry out the intent of the contract plans. The contractor shall coordinate fabrication with the proposed form layouts.

F. Splices and Laps shall conform to the requirements of ACI 318 and ACI 315. Splices and laps shall be a minimum of 36 bar diameters in length unless otherwise noted on the plans, and shall be staggered wherever possible. Welded wire fabric shall be spliced not less than one cross wire spacing plus 2 inches.

G. All reinforcement shall be cleaned of rust, loose mill scale or other foreign material such as ice or mud which would reduce or destroy the bond with concrete.

H. General: Reinforcement shall not be bent or straightened in any manner injurious to the material. Bars with kinks or bends not shown on the plans shall not be used.

I. The minimum center to center distance between parallel bars shall be 2-1/2 times the diameter of the bars. In no case shall the clear spacing between bars be less than one inch nor less than 1-1/3 times the maximum size of the coarse aggregate. The maximum center to center distance in parallel bars shall be 18" inches.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. All monolithic cast-in-place concrete work complete with materials, mixes, installation and testing.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 03100 - Concrete Formwork: Formwork and accessories.

C. Section 03200 - Concrete Reinforcement.

D. Section 32 1123 – Aggregate Base Course: Sand pad for slab-on-grade.

E. Section 32 1313 – Concrete Paving.

1.3 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

C. ACI 305R - Hot Weather Concreting.

D. ACI 306R - Cold Weather Concreting.

E. ACI 318 - Building Code Requirements for Reinforced Concrete.

F. ASTM C33 - Concrete Aggregates.

G. ASTM C94 - Ready-Mixed Concrete.

H. ASTM C150 - Portland Cement.

I. ASTM C260 - Air Entraining Admixtures for Concrete.

J. ASTM C330 - Light Weight Aggregates For Structural Concrete.

K. ASTM C494 - Chemical Admixtures for Concrete.

L. ASTM C618 - Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

M. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction Non-extruding and Resilient Bituminous Types.

1.4 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on joint devices, attachment accessories and admixtures.

C. Samples: Submit two 6 inch long samples of expansion/contraction joint and control joint.

D. Design Mix: Submit written reports to Architect of each proposed mix for each type of concrete at least 15 days prior to start of Work. Indicate with each mix design the items or structures for which it is to be used. Do not begin concrete production until mixes have been reviewed and approved by Architect. Submit the following information:

1. Complete identification of aggregate source of supply.

2. Tests of aggregates for compliance with specified requirements.

3. Scale weight of each aggregate.

4. Absorbed water in each aggregate.

5. Brand, type and composition of cement.

6. Brand, type and amount of each admixture.

7. Amounts of water used in trial mixes.

8. Proportions of each material per cu.yd., including fibrous secondary reinforcement.

9. Gross weight and yield per cu.yd. of trial mixtures.

10. Measured slump.

11. Measured air content.

12. Compressive strength developed at 7 days and 28 days, from not less than 3 test cylinders cast for each 7 and 28 day test, and for each design mix. These test reports may be from previous projects within the past 6 months.

13. Identification number or name of mix to verify agreement with compression test reports.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

A. Submit under provisions of Section 01700.

B. Accurately record actual locations of embedded utilities and components which are concealed from view.

1.6 QUALITY ASSURANCE

A. Maintain quality under provisions of Section 01400.

B. Perform Work in accordance with ACI 301.

C. Acquire cement and aggregate from same source for all work.

D. Conform to ACI 305R when concreting during hot weather.

E. Conform to ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type IA - Normal unless otherwise acceptable to Architect.

B. Fine and Coarse Aggregates: ASTM C33.

1. Local aggregates not complying with ASTM C33, but which have shown by special test or actual service to produce concrete of adequate strength and durability, may be used when acceptable to the Architect.

2. Fine Aggregate: Clean, sharp, natural sand free from loam, clay lumps, or other deleterious substances.

3. Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:

a. Crushed stone, processed from natural rock or stone.

b. Limestone 6AA. Use of pit or bank run gravel is not permitted.

c. Maximum Aggregate Size: Not larger than one-fifth of narrowest dimension between sides of forms, one-third of depth of slabs, nor three-fourths of minimum clear spacing between individual reinforcing bars or bundles of bars.

C. Lightweight Aggregate: ASTM C330.

D. Water: Clean, potable and not detrimental to concrete.

2.2 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Chemical: ASTM C494 Type A - Water Reducing; Type F - Water Reducing, High Range.

C. Fly Ash: ASTM C618 Type C may be substituted for up to 20 percent of Portland Cement in all mixes unless otherwise noted.

2.3 ACCESSORIES

A. Bonding Agent: Latex emulsion, film forming, freeze the resistant compound suitable for brush or spray application.

B. Vapor Barrier: 6 mil thick, clear polyethylene film, type recommended for below grade application.

C. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

2.4 JOINT DEVICES AND FILLER MATERIALS

A. Construction Joint Devices: Integral galvanized steel 22 gage thick, formed to tongue and groove profile, with holes for stake pins at 24" o.c.

B. Joint Filler: ASTM D1751; Asphalt impregnated fiberboard or felt, 1/4 inch thick, full depth of joint.

C. Sealant and Primer: As specified in Section 07900.

2.5 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94, Alternative No. 2.

B. Select proportions for normal weight concrete in accordance with ACI 301 Method 1 or Method 2.

C. Provide concrete meeting the following criteria:

1. Concrete

Unit	Measurement
Compressive Strength (28 day)	3500 psi
Water/Cement Ratio (maximum)	.55 non-air entrained
	.51 air entrained
Fly Ash Content:	Maximum 20 percent of cement content
Slump	4 inches

D. Use accelerating admixtures in cold weather only when approved by Architect/Engineer.

E. Use of admixtures will not relax cold weather placement requirements.

F. The use of calcium chloride will not be permitted.

G. Use set retarding/water reducing admixtures during hot weather only when approved by Architect/Engineer.

H. Add air entraining agent to normal weight concrete mix for all exterior concrete unless indicated otherwise. Add air entraining agent at the manufacturers prescribed rate to result in concrete at the point of placement having air content within the following limits.

1. Concrete structures and slabs exposed to freezing and thawing or subjected to hydraulic pressure:

   a. 3 to 15 percent for maximum 2 inches aggregate.

   b. 4-1/2 to 6-1/2 percent for maximum 1 inch aggregate.

   c. 5 to 7 percent for maximum 3/4 inch aggregate.

   d. 6 to 8 percent for maximum 1/2 inch aggregate.

   e. Other Exterior Concrete: 2 to 4 percent air.

2. Fly Ash, and water reducers shall be used to obtain required slump while maintaining maximum water-cement ratio.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site conditions under provisions of Section 01400.

B. Verify that requirements for concrete cover over reinforcement have been met.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

D. Inspect soil at bottom of foundation systems which will be subject to testing for soil bearing value by the testing laboratory, as directed by the Architect. Place concrete immediately after approval of foundation excavations.

E. Inspect underslab subgrade subject to testing for soil bearing value by the testing laboratory as required by Architect. Place concrete immediately after approval of underslab compaction tests.

3.2 PREPARATION

A. Prepare surfaces to receive new work under provision of Section 01400.

B. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

C. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

D. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 304.

B. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints and are not disturbed during concrete placement.

C. Install vapor barrier under all interior slabs on grade. Lap joints 6" minimum seal edges and ends water tight with tape.

D. Repair damage to vapor barrier as concrete placement proceeds. Repair tears with overlapping sheets 6" minimum all around and seal with tape.

E. Separate slabs on grade from vertical surfaces with 1/2 inch thick premolded expansion joint filler (except integral walk and curb).

F. Place expansion joint filler in concrete curbs and walks as indicated. Set top to required elevations. Secure to resist movement by wet concrete. If not indicated, locate expansion joints at 30'-0" o.c. unless shown otherwise.

G. Extend expansion joint filler from bottom of slab to full depth flush with finished slab surface.

H. Install joint devices in accordance with manufacturer's instructions.

I. Install construction joint devices in coordination with interior floor slab placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

1. Locate construction joints in slabs-on-grade, so as to divide the slab into areas not exceeding 4000 s.f. (maximum distance of 75 ft. in any one direction, unless shown otherwise).

J. Install joint device anchors. Maintain correct position to allow joint cover to be flush with floor.

K. Provide control joints in slabs on ground to form panels or patterns as shown on slab plan. Use inserts 1/5 to 1/4 of slab depth, unless otherwise indicated. When not shown, locate control joints at 15 foot maximum spacing both directions.

1. Form control joints by saw cuts 3/4 to 1 inch deep, using powered cutters as soon as concrete has cured sufficiently to carry the machine weight without causing surface blemishes, but not later than 12 hours after concrete is placed.

L. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

M. Place concrete continuously between predetermined expansion, control, and construction joints.

N. Do not interrupt successive placement; do not permit cold joints to occur.

O. Place floor slabs in pattern indicated.

P. Addition of water to the mix after batch will not be permitted.

3.4 FINISH OF FORMED SURFACES

A. Rough Form Finish (RfFm-Fn): For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise shown or specified. This is the concrete surface having the texture imparted by the form facing material used, with tie holes and defective areas required and patched and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.

B. Smooth Form Finish (SmFm-Fn): For formed concrete surfaces exposed-to-view or that are to be covered with a coating material applied directly to the concrete or a covering material bonded to the concrete, such as waterproofing, dampproofing, painting, or other similar system. This is the as-cast concrete surface as obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams.

C. Grout Cleaned Finish (GrtC1-Fn): For formed concrete surfaces, which are to be coated to provide uniform color and texture, provide the following finish to surfaces specified as grout cleaned finish GrtCl-Fn in the Concrete Schedule.

1. Combine one part portland cement to 1-1/2 parts fine sand by volume, and mix with water to the consistency of thick paint. Blend standard portland cement and white portland cement, amounts determined by trail patches, so that the final color of dry grout will closely match adjacent concrete surfaces.

2. Thoroughly wet concrete surfaces and apply grout immediately to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

D. Related Unformed Surfaces

1. At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continuous final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise shown.

3.5 MONOLITHIC SLAB FINISHES

A. General Information (Slabs on Grade): Above average floor finish tolerances may be required. The requirements indicated are based upon the latest FF/FL method. Bids for this work shall reflect these requirements and enforcement thereof can be expected.

B. Float Finish (Flt-Fn) - Not Critical Floor Tolerance:

1. Specified Overall Value: FF 25/FL 20

2. Minimum Local Value: FF 20/FL 17

3. Apply float finish to monolithic slab surfaces that are to receive trowel finish and other thick finishes as hereinafter specified, and slab surfaces which are to be covered with mortar bed tile, and as otherwise shown on Drawings or in schedules.

C. Trowel Finish 1 (Tr-Fn1) - Normal Sized Rooms:

1. Specified Overall Value: FF 30/FL 23

2. Minimum Local Value: FF 25/FL 20

3. Apply trowel finish to slab surfaces that are to be covered with resilient flooring, paint, or other thin film finish coating system.

D. Trowel Finish 2 (Tr-Fn2) - Large Rooms and Public Areas:

1. Specified Overall Value: FF 36/FL 25

2. Minimum Local Value: FF 30/FL 22

3. Apply trowel finish to monolithic slab surfaces that are to receive resilient flooring, carpet, or other thin finish system.

E. Trowel Finish 3 (Tr-Fn3) - High tolerance Floors where indicated:

1. Specified Overall Value: FF 50/FL 30

2. Minimum Local Value: FF 40/FL 25

3. Apply trowel finish to slab surfaces that are to be covered with wood flooring, paint, or other thin film finish coating system.

F. Elevated slabs shall have a specified overall value of FF 22 to FF 27 and a minimum local of FF 20 with no Fl number defined.

3.6 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete form premature drying and excessive cold or hot temperature, and maintain without drying at a relatively constant temperature for a period of time necessary for hydration of cement and proper hardening.

1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 72 hours.

2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days and in accordance with ACI 301-84(87) procedures. Avoid rapid drying at end of final curing period.

B. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by membrane-forming curing, and by combinations thereof, as herein specified.

1. Provide moisture curing by following methods:

a. Keep concrete surface continuously wet by covering with water.

b. Continuous water-fog spray.

c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously set. Place absorptive cover to provide coverage of concrete surfaces and edges with 4 inch lap over adjacent absorptive covers.

2. Provide moisture-cover curing as follows:

a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Provide membrane curing to slabs as follows (not for areas to receive sealer/hardeners):

a. Apply membrane-forming curing compound to concrete surfaces as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by powerspray or roller in accordance with manufacturer's directions. Recoat areas which are subjected to heavy rainfall within 3 hours after initial application. maintain continuity of coating and repair damage during curing period.

b. Do not use membrane curing compounds on surfaces which are to receive concrete overlays or additional toppings.

3.7 MISCELLANEOUS CONCRETE ITEMS

A. Do not apply sealers / hardeners where overlays are to occur, such as hard tile mortar beds, paint finishes, etc., without prior research and approval.

B. Concrete Sealers and Hardener (Moisture curing/Cover only)

1. Apply sealers and hardener in strict accordance with the manufacturer's written instructions.

C. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete the work.

D. Curbs, Steps, and Risers: Provide monolithic finish to interior curbs, steps and risers by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded as indicated on Drawings.

E. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on Drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certifying diagrams or templates of the manufacturer furnishing machines and equipment.

3.8 FIELD QUALITY CONTROL

A. Maintain quality under provisions of Section 01400.

B. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.

C. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.

D. Four concrete test cylinders will be taken for every 100 or less cu. yds. of each class of concrete placed each day.

E. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.

F. One slump test will be taken for each concrete load at the point of delivery.

3.9 PATCHING

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, but only when acceptable to Architect.

1. Cut out honeycomb, rock pockets, voids over 1/2 inch diameter, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Before placing cement mortar, thoroughly clean, dampen with water, and brush-coat the area to be patched with neat cement grout. Proprietary patching compounds may be used when acceptable to the Architect.

2. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color of surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surfaces.

B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, and holes left by tie rods and bolts; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning.

1. Repair concealed formed surfaces, where possible, that contain defects that adversely affect the durability of the concrete. If defects cannot be repaired, remove and replace the concrete.

C. Repair of unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and to verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

1. Repair finished unformed surfaces that contain defects which adversely affect durability of concrete. Surface defects, as such, include crazing, cracks, in excess of 0.01 inch wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

2. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.

4. Repair defective areas, except random cracks and single holes not exceeding one inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4 inch clearance. Dampen concrete surfaces in contact with patching concrete and brush with a neat cement grout coating or concrete bonding agent. Place patching concrete before grout takes its initial set. Mix patching concrete of same materials to provide concrete of the same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

5. Repair isolated random cracks and single holes not over one inch in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt and loose particles. Dampen cleaned concrete surfaces and brush with neat cement grout coating. Place dry-pack before cement grout takes its initial set. Mix dry-pack before cement grout takes its initial set. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate using a No. 16 mesh sieve, using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched areas continuously moist for not less than 72 hours.

3.10 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by the Architect/Engineer.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

3.11 CONCRETE FINISH SCHEDULE

A. Concrete not otherwise indicated: RfFm-Fn or SmFm-fn as applicable.

B. Foundations and footings: RfFm-Fn or SmFm-fn as applicable.

C. Interior formed concrete exposed to view: SmFm-fn.

D. Interior floor slabs scheduled to receive mudset tile: Flt-fn.

E. Interior floor slabs scheduled to receive resilient, thin film, and/or wood floor finish: Tr-Fn1, Tr-Fn2, or Tr-Fn3 as applicable.

F. Exterior formed concrete exposed to view: GrtCl-Fn.

END OF SECTION

SECTION 03451

ARCHITECTURAL PRECAST CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Architectural precast concrete window sills, and decorative accents.

B. Supports, anchors, and attachments.

C. Intermediate joint seals.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 04300 – Unit Masonry Systems: Supporting masonry.

C. Section 07900 - Joint Sealers: Perimeter joints with sealant and backing.

1.3 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.

B. ASTM A185 - Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement.

C. ASTM A615/A615M - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

D. ASTM C33 - Concrete Aggregates.

E. ASTM C150 - Portland Cement.

F. ASTM C260 - Air-Entraining Admixtures for Concrete.

G. PCI MNL-117 - Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.

H. PCI MNL-122 - Architectural Precast Concrete.

1.4 DESIGN REQUIREMENTS

A. Design units to withstand actual loads such as thermal movement and masonry dead loads.

B. Design units to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

C. Design component connections to accommodate building movement and thermal movement. Provide adjustment to accommodate misalignment of structure without unit distortion or damage.

1.5 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01600.

B. Shop Drawings: Indicate layout, unit locations, configuration, unit identification marks, reinforcement, connection details, support items, dimensions, openings, and relationship to adjacent materials.

C. Samples: Provide two 4 inch by 4 inch samples illustrating surface finish, color and texture.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with PCI MNL-117 and PCI MNL-122.

B. Fabricator: Company specializing in performing the work of this section with minimum five years experience

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Transport, deliver, handle, store, and protect products under provisions of Division 1.

B. Handle precast units to position, consistent with their shape and design. Lift and support only from support points.

C. Blocking and Lateral Support During Transport and Storage: Clean, non-staining, without causing harm to exposed surfaces. Provide temporary lateral support to prevent bowing and warping.

D. Protect units to prevent staining, chipping, or spalling of concrete.

E. Mark units with date of production in location not visible to view when in final position in structure.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cement: ASTM C150, Type I - Normal Portland type; grey color for facing mix.

B. Concrete Materials: ASTM C33; water and sand.

C. Reinforcing Steel: ASTM A615, epoxy coated deformed steel bars, strength and size commensurate with precast unit design.

D. Air Entrainment Admixture: ASTM C260.

E. Admixtures: As specified in Concrete Specification.

F. Surface Finish Aggregate: Clean, washed, smooth, natural limestone, from single source throughout.

G. Grout: Non-shrink, Non-metallic, minimum 10,000 psi, 28 day strength.

2.2 SUPPORT DEVICES

A. Connecting and Support Devices: As specified in Section 04300 - Unit Masonry Systems.

2.3 ACCESSORIES

A. Sealant: One component elastomeric polyurethane type specified in Section 07900.

2.4 MIX

A. Concrete: Minimum 5000 psi, 28 day strength, air entrained to 5 to 7 percent in accordance with ACI 301.

2.5 FABRICATION

A. Fabricate in conformance with PCI MNL-117.

B. Maintain plant records and quality control program during production of precast units. Make records available upon request.

C. Use rigid molds, constructed to maintain precast unit uniform in shape, size, and finish.

D. Maintain consistent quality during manufacture.

E. Fabricate inserts for connecting devices. Fabricate to permit initial placement and final attachment.

F. Embed reinforcing steel.

G. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.

H. Minor patching in plant is acceptable, providing structural adequacy and appearance of units is not impaired.

2.6 FINISH - PRECAST UNITS

A. Finish: Ensure exposed-to-view finish surfaces of precast units are uniform in color and appearance, and match approved samples.

2.7 FABRICATION TOLERANCES

A. Maintain tolerances under provisions of Division 1.

B. Conform to PCI MNL-117.

C. Maximum Out of Square: 1/8 inch in 10 feet, non-cumulative.

D. Variation From Dimensions Indicated on Shop Drawings: Plus or minus 1/8 inch.

E. Maximum Misalignment of Anchors, Inserts, Openings: 1/8 inch.

F. Maximum Bowing of Units: Length of bow/360.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine project conditions under provisions of Section 01400.

B. Verify that building structure, anchors, devices, and openings are ready to receive work of this section.

3.2 PREPARATION

A. Prepare substrate to receive new work under provisions of Section 01400.

B. Provide for erection procedures and induced loads during erection. Maintain temporary bracing in place until final support is provided.

3.3 ERECTION

A. Erect units without damage to shape or finish. Replace or repair damaged items.

B. Erect units level and plumb within allowable tolerances.

C. Align and maintain uniform horizontal and vertical joints as erection progresses.

D. When units require adjustment beyond design or tolerance criteria, discontinue affected work; advise Architect/Engineer.

E. Set vertical units dry, without grout, attaining joint dimension with lead or plastic spacers. Pack grout to base of unit.

F. Exposed Joint Dimension: 3/8" inch.

G. Seal intermediate joints in accordance with Section 07900.

3.4 ERECTION TOLERANCES

A. Maintain tolerances under provisions of Section 01400.

B. Maximum Variation from Plane of Location: 1/4 inch in 10 feet and 3/8 inch in 100 feet, non-cumulative.

C. Maximum Offset from True Alignment Between Two Connecting Units: 1/8 inch.

D. Joint Tolerance: Plus or minus 1/16 inch.

END OF SECTION

SECTION 04100

MORTAR AND MASONRY GROUT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Mortar and grout for masonry.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 04300 - Unit Masonry System: Installation of mortar and grout.

C. Section 03451 – Architectural Precast Concrete: Grouting architectural precast concrete units.

1.3 REFERENCES

A. ACI 530 - Building Code Requirements for Masonry Structures.

B. ACI 530.1 - Specifications For Masonry Structures.

C. ASTM C91 - Masonry Cement.

D. ASTM C94 - Ready-Mixed Concrete.

E. ASTM C144 - Aggregate for Masonry Mortar.

F. ASTM C150 - Portland Cement.

G. ASTM C207 - Hydrated Lime for Masonry Purposes.

H. ASTM C270 - Mortar for Unit Masonry.

I. ASTM C404 - Aggregates for Masonry Grout.

J. ASTM C476 - Grout for Masonry.

K. ASTM C780 – Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

L. ASTM C1019 - Method of Sampling and Testing Grout.

M. ASTM C1072 – Test Method for Measurement of Masonry Flexural Bond Strength.

N. ASTM E447 – Test Methods for Compressive Strength of Masonry Prisms.

O. ASTM E518 – Test Methods for Flexural Bond Strength of Masonry.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Include design mix (for all types), indicate whether the Proportion or Property specification of ASTM C270 is to be used, required environmental conditions, and admixture limitations.

C. Reports: Submit reports on mortar indicating conformance of mortar to property requirements of ASTM C270 component mortar materials to requirements of ASTM C270.

D. Reports: Submit reports on grout indicating conformance of component grout materials to requirements of ASTM C476 and test and evaluation reports to ASTM C1019.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Submit premix mortar manufacturer's installation instructions under provisions of Section 01300.

1.5 QUALITY ASSURANCE

A. Maintain quality under provisions of Section 01400.

B. Perform Work in accordance with ACI 530 and ACI 530.1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 01600.

B. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1. Store materials off the ground, under cover, using tarpaulins, felt paper, or polyethylene sheets in a dry location.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions under provisions of Section 01400.

B. Maintain materials and surrounding air temperature to minimum 50 degrees F (10 degrees C) prior to, during, and 48 hours after completion of masonry work.

C. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Portland Cement Lime (PCL); the use of masonry cement (MC) shall not be used unless pre-approved by the Architect <u>in writing</u>.

B. Portland Cement: ASTM C150, Type I, non staining, without air entraining, of natural color or white, to produce required color of mortar or grout.

C. Masonry Cement: Current ASTM C91, nonstaining with 12 to 22 percent air content by volume.

D. Mortar Aggregate: ASTM C144, standard masonry type except for joints 1/4 inch or less, use aggregate graded to pass No. 16 sieve 100%.

E. Hydrated Lime: ASTM C207, Type S.

F. Grout Course Aggregate: ASTM C404, clean, uncoated, pea gravel containing no foreign matter. Max. aggregate size 3/4 inch.

G. Grout Fine Aggregate: Clean, sharp, sand.

H. Water: Clean and potable.

I. Bonding Agent: Epoxy.

2.2 MORTAR MIXES

A. Mortar for Masonry at or below grade (masonry in contact with earth): ASTM C270, Type M using the Property specification.

B. Mortar for Unreinforced Exterior Load Bearing and Non-load Bearing Walls, Bearing Interior Walls, and Partitions (masonry not in contact with earth): ASTM C270, Type S using the Property specification.

C. Mortar for Engineered (Reinforced) Masonry: ASTM C270, Type M using the Property specification.

D. Pointing Mortar: ASTM C270, Type N using the Property specification (with maximum 2 percent ammonium stearate or calcium stearate per cement weight.

E. Stain Resistant Pointing Mortar: One part Portland cement, 1/8 part hydrated lime, and two parts graded (80 mesh) aggregate, proportioned by volume. Add aluminum tristearate, calcium stearate, or ammonium stearate equal to 2 percent of Portland cement by weight.

2.3 MORTAR MIXING

A. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Do not use anti-freeze compounds to lower the freezing point of mortar.

D. If water is lost by evaporation, re-temper only once within two hours of mixing.

E. Use mortar within two hours after mixing at temperatures of 90 degrees F (32 degrees C), or two-and-one-half hours at temperatures under 50 degrees F

2.4 MASONRY GROUT MIXES

A. Grout for Bond Beams, Lintels: 3,500 psi strength at 28 days; premixed type in accordance with ASTM C94. Mixed in accordance with ASTM C476 for fine or course grouts.

B. Grout for Filled Masonry or Engineered Masonry: 3,500 PSI strength at 28 days; 8-10 inches slump; mix in accordance with ASTM C476.

1. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.

2. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.5 MASONRY GROUT MIXING

A. Mix grout in accordance with ASTM C94, or if mixed on site, thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM 476 for fine or coarse grouts.

B. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

C. Do not use anti-freeze compounds to lower the freezing point of grout.

D. Do not use calcium chloride in grout.

2.6 MIX TESTS

A. Maintain quality under provisions of Section 01400.

B. Testing of Mortar Mix: In accordance with ASTM C270.

C. Testing of Grout Mix: In accordance with ASTM C1019.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine project conditions under provisions of Section 01400.

B. Examine and verify that spaces to be grouted are clean, free of debris or other deleterious materials and ready to receive the work.

3.2 PREPARATION

A. Prepare substrate to receive new work under provisions of Section 01400.

B. Apply bonding agent to existing concrete and face brick surfaces where new masonry is required to bond to existing surfaces.

C. Plug clean-out holes with brick, block masonry units. Brace masonry for wet grout pressure.

3.3 INSTALLATION

A. Install mortar in accordance with ASTM C270. Install grout in accordance with ASTM 476.

B. Remove excess mortar from grout spaces.

C. Work grout into masonry cores and cavities to eliminate voids.

D. Do not install grout in lifts greater than 16" inches, two (2) CMU courses without consolidating grout by rodding.

E. Do not displace reinforcement while placing grout.

3.4 FIELD QUALITY CONTROL

A. Maintain quality under provisions of Section 01400.

B. Test and evaluate mortar in accordance with ASTM C780.

C. Test and evaluate grout in accordance with ASTM C1019.

D. Test mortar and masonry units to ASTM C1072, E447, and E518; test in conjunction with masonry unit sections specified.

END OF SECTION

SECTION 04300

UNIT MASONRY SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete Masonry and Brick Units.

B. Reinforcement, anchorage, and accessories.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 03459 – Architectural Precast Concrete: precast concrete sill units and caps.

B. Section 05120 - Structural Steel: Placement of steel anchors.

C. Section 05500 – Metal Fabrications: Placement of loose steel lintels and fabricated steel items.

1.3 RELATED SECTIONS

A. Division I - General Requirements

B. Section 03200 - Concrete Reinforcing: Reinforcing in engineered masonry.

C. Section 04100 - Mortar and Masonry Grout: Mortar and grout.

D. Section 07270 – Air Barriers: Wood framed cavity wall moisture barrier.

E. Section 07900 - Joint Sealers: Rod and sealant at control joints.

F. Section 09900 – Painting: Field finishing of interior masonry walls.

1.4 REFERENCES

A. ACI 530 - Building Code Requirements for Masonry Structures.

B. ACI 530.1 - Specifications For Masonry Structures.

C. ASTM A-153 - Class B2 Specification to include coating (hot dip) on iron and steel hardware.

D. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

E. ASTM B370 - Copper Sheet and Strip for Building Construction.

F. ASTM C90 - Load-Bearing Concrete Masonry Units.

G. ASTM C140 – Test Methods of Sampling and Testing Concrete Masonry Units.

H. ASTM C272 – Test Methods for Water Absorption of Core Materials for Structural Sandwich Construction.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data for masonry units and fabricated wire reinforcement, anchors, preformed joints, etc., all masonry accessories.

C. Samples: Submit four (4) samples of face brick units to illustrate color, texture and extremes of color range.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Welders Certificates: Certify Welders Employed on the work, verifying ANS qualification within the previous twelve months.

F. Submit unit masonry test data showing breaking strength and average net area compressive strength.

1.6 QUALITY ASSURANCE

A. Maintain quality under provisions of Section 01400.

B. Perform Work in accordance with ACI 530 and ACI 530.1.

C. Welding associated with the work of this section shall be performed by Certified Welder.

1.7 QUALIFICATIONS

A. Maintain quality under provisions of Section 01400.

B. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three (3) years experience.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products under the provisions of Section 01600.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions under provisions of Section 01400.

B. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

C. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

1.10 JOB CONDITIONS

A. Protect installed work under provisions of Section 01500.

B. Protect partially completed masonry against weather, when work is not in progress by covering top of walls with a strong, waterproof, nonstaining membrane - extend membrane at least 2 foot down both sides of walls and anchor securely in place.

C. Protect partially completed masonry walls against wind damage by bracing as required until support of walls is integral with the building structure.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Hollow Load-Bearing Block Units (CMU) for Below Grade Applications: ASTM C90, Type I - Moisture Controlled; normal weight.

1. Net Compressive Strength of Units: 3,750 when tested in accordance with ASTM C140.

B. Hollow Load-Bearing Block Units (CMU) for Above Grade Applications: ASTM C90, Type I - Moisture Controlled; light weight.

1. Net Compressive Strength of Units: 3,750 when tested in accordance with ASTM C140.

2. Size and Shape: Nominal modular sizes as indicated and/or required. Provide special units for 45 degree corners, bond beams, lintels, sash, control joint, header and bullnosed corners.

2.2 DECORATIVE CONCRETE UNITS

A. Concrete Brick Units: ASTM C90, integral colored, nominal 4 inch high x 16 inch long x 4 inch thick masonry unit manufactured with integral water repellency, equal to BellaBrik as manufacturer by Consumers Concrete Corporation.

2.3 WATER REPELLANT PENETRANT

A. Single component, water based, VOC compliant, blended silane/siloxane penetrating sealer equal to Enviroseal Double 7 H.D. as manufactured by Hydrozo Chemrex Inc.

2.4 REINFORCEMENT AND ANCHORAGE

A. Single Wythe Joint Reinforcement: Truss type; hot dip galvanized to ASTM A153 Class B2 after fabrication, for exterior walls, 9 ga. side rods with 9 ga. cross ties.

1. Manufacturers:

a. Masonry Reinforcing Corp. of America; Model: Truss type Series 300.

b. Hohman & Barnard Inc.; Model: Truss type Series 120.

c. Or equal

B. Exterior Cavity Wall and Composite Wall Joint Reinforced Ladder type; adjustable type, steel wire, hot dip galvanized to ASTM A153 Class B2 after fabrication, 3/16 inch side rods with 9 ga. cross ties.

1. Manufacturers:

a. Masonry Reinforcing Corp. of America; Model: Truss Type Series 800.

b. Hohman & Barnard Inc.; Model: Truss type Series 270.

c. Or equal

C. Reinforcing Steel: ASTM A615, 60 yield grade, deformed billet bars, uncoated finish, as specified in Section 03200.

D. Wall Ties: Wire mesh 16 inch long x 1" less in widths than CMU width x 16 gauge thick hot dip galvanized to ASTM A153 B2 for bonding intersecting masonry walls.

1. Manufacturers:

a. Masonry Reinforcing Corp. of America; Model: Series 1900

b. Hohman & Barnard Inc.; Model: MWT

c. Or equal

E. Veneer Ties: Adjustable veneer anchor consisting of L shaped plate with holes for connecting screws and eyelets for pintle insertion allowing vertical adjustment. Fabricate from 14 ga. thick steel with legs fabricated to accommodate 1-1/2” thick insulation.

1. Manufacturers:

a. Masonry Reinforcing Corp. of America; Model: RJ-711.

b. Hohman & Barnard Inc.; Model: HB0200.

c. Or equal

2.5 MORTAR AND GROUT

A. Mortar and Grout: As specified in Section 04100.

2.6 FLASHINGS

A. Copper/Fabric Laminate Flashings: 3 oz/sq ft sheet copper bonded to asphalt impregnated glass fabric both sides, crimped full sheet width manufactured by one of the following:

1. Manufacturers:

a. AFCO Products

b. Phoenix Building Products

c. York Manufacturer

d. Or equal

B. Copper Sheet Flashings: Fabricated from ASTM B370 cold rolled; .027 inch thick; natural finish.

C. Lap sealant: Butyl type.

2.7 CAVITY INSULATION

A. Extruded Polystyrene Insulation. ASTM C578 Type IV conforming to the following:

1. Board Thickness: 1 1/2" inches.

2. Thermal Resistance: Minimum R value of 5 per inch of thickness.

3. Water Absorption: In accordance with ASTM C272 .1 percent by volume maximum.

4. Compressive Strength: Minimum 25 psi.

5. Board Edges: Square edges.

B. Mastic: Equal to Contech Brands "PL300" or H.B. Fuller "MaxBond" for application to CMU for perimeter insulation and cavity wall insulation.

2.8 LINTELS

A. Concrete Masonry Lintels: Site cast CMU lintels utilizing bond beam blocks, reinforcing and grout, sized according to construction drawings. Bottom exposed surface to be free of defects, pits, ridges, etc.

2.9 ACCESSORIES

A. Joint Filler: Closed cell neoprene; oversized 50 percent to joint width; self expanding; in maximum lengths.

1. Manufacturers:

a. Williams Products, Troy, Michigan; Model: Neoseal IV 2218-3

b. Construction Gaskets, inc., Farmington, Michigan; Model: Brickseal

c. Or equal

B. Building Paper: No. 15 asphalt saturated felt.

C. Peastone: Pea gravel as specified in Section 02207.

D. Cleaning Solution: As recommended by masonry unit manufacturer, not harmful to masonry work or adjacent materials.

E. Masonry Wall Clamp: Masonry "Wall Cover Clamp" #AA3000 as manufactured by AA Wire Products Company, Chicago, Illinois or equal. Wall cover clamp shall be used to clamp over nonstaining membrane over top of partially completed masonry walls.

F. ReBar Positions: Single or double O-ring, 9 ga., mill galvanized

1. Manufacturers:

a. Masonry Reinforcing Corporation of America

b. Hohmann & Barnard, Inc.

c. Or equal

G. Rebar Lap-Joint tie - “Spyra-Lox” as manufactured by Hohmann & Barnard, Inc. or equal.

H. Cavity Vents and Weeps: Polypropylene, 3/8" X 2-1/2" X 3-3/8" size, color to match adjacent mortar. Equal to Advanced Building Products, Inc.; Mortar Maze Cell Vents.

I. Mortar Deflection Device: Polymer core geomatrix composed of polymer strands woven into a 0.80 inch thick mesh. Equal to Advanced Building Products, Inc; Mortar Break.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site conditions under provisions of Section 01400.

B. Verify that field conditions are acceptable and are ready to receive work.

C. Verify items provided by other sections of work are properly sized and located.

D. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

A. Prepare substrate under provisions of Section 01400.

B. Direct and coordinate placement of metal anchors supplied to other sections.

C. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:

1. Bond: Running bond

2. Coursing: One unit and one mortar joint to equal 8" inches.

3. Mortar Joints: Concave.

D. Brick Units:

1. Bond: Running or as detailed on construction drawings to match existing.

2. Coursing: Three units and three mortar joints to equal 8" inches or as to match existing.

3. Mortar Joints: To match existing.

3.4 PLACING AND BONDING

A. Lay hollow masonry units with face shell bedding on head and bed joints.

B. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.

C. Remove excess mortar as work progresses.

D. Interlock intersections and external corners.

E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

1. Do not place chipped, cracked, wet or damaged CMU or face brick units.

G. Tool joints exposed to view to smooth concave finish. Except where required for subsequent finish, tool joints concealed from view to consolidated mortar.

H. Cut mortar joints flush where wall tile is scheduled, cavity insulation vapor barrier adhesive is applied, or bitumen dampproofing is applied.

I. Isolate masonry partitions from vertical structural framing members with a control joint as indicated or specified.

J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

K. Incorporate a "cant" at concrete footings/CMU wall(s) as required per manufacturer for dampproofing and/or waterproofing applications.

3.5 INSULATION CAVITY WALLS

A. Apply adhesive in three continuous beads per board length 1/2" thick on substrate.

B. Install boards horizontally between wall reinforcement.

C. Place boards in a method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and to protrusions.

D. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

3.6 WEEPS AND VENTS

A. Provide weeps in veneer at 32" inches o.c. (maximum) horizontally above through-wall flashing, above shelf angles and lintels, and above cavity flashing at exterior.

B. Provide vents in veneer at 32" o.c. (maximum) horizontally. Locate vents at first bed joint exposed to exterior below top of veneer where cavity is blocked by construction above.

3.7 CAVITY WALL

A. Do not permit mortar to accumulate into cavity air space.

B. Build inner wythe ahead of outer wythe to receive cavity insulation and air/vapor barrier adhesive.

3.8 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

A. Install horizontal joint reinforcement 16 inches.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place joint reinforcement continuous in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Reinforce stack bonded unit joint corners and intersections with strap anchors 24" inches o.c.

3.9 REINFORCEMENT AND ANCHORAGES - CAVITY WALL MASONRY

A. Install horizontal joint reinforcement 16" inches o.c. for running bond, 16" o.c. for stacked bond.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16" inches each side of opening.

C. Place joint reinforcement continuous in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6" inches.

E. Reinforce stack bonded unit joint corners and intersections with strap anchors 16" inches o.c.

3.10 OPENING REINFORCING

A. Provide continuous reinforcing around openings in masonry as indicated on the plans.

B. Extend reinforcing 24" past each side and top of opening.

C. Grout CMU cores solid at reinforcing.

3.11 MASONRY FLASHINGS

A. Provide copper fabric flashings at through wall and grade locations. Coordinate insulation of flashings with moisture barrier installation.

B. Provide two piece copper fabric and copper sheet metal flashing with 1/4 inch hemmed drip at lintels or other openings in masonry.

C. Extend flashings horizontally above masonry veneer ledge or shelf angles and lintels, and above wall intersection with exterior grade.

D. Turn flashing up minimum 8" inches and bed into mortar joint of masonry back-up or seal into secondary moisture barrier as directed by moisture barrier manufacturer.

E. Lap end joints minimum 6" inches and seal watertight.

F. Turn flashing, fold, and seal at corners, bends, and interruptions.

3.12 LINTELS

A. Install loose steel and precast concrete lintels over openings as indicated on the drawings.

B. Where not indicated, install reinforced unit masonry lintels over openings as follows:

1. Openings Up To 40" inches Wide: Place two No. 4 reinforcing bars 1" inch from bottom web.

2. Openings From 40" inches Up To 64" inches Wide: Place 3 No. 5 reinforcing bars 1 from bottom web.

3. Openings Over 64" inches: Consult Architect / Engineer.

C. Do not splice reinforcing bars.

D. Support and secure reinforcing bars from displacement. Maintain position within 1/2" inch of dimensioned position.

E. Place and consolidate grout fill without displacing reinforcing.

F. Allow masonry lintels to attain specified strength before removing temporary supports.

G. Maintain minimum 8" inch bearing on each side.

3.13 GROUTED COMPONENTS

A. Reinforce bond beam as indicated in construction drawings.

B. Reinforce piers and pilasters as indicated in construction drawings.

C. Lap splices minimum 24 bar diameters and tie or butt weld.

D. Support and secure reinforcing bars from displacement. Maintain position within 1/2" inch of dimensioned position.

E. Place and consolidate grout fill without displacing reinforcing.

F. At bearing locations, fill masonry cores each side of opening as follows: 8" inches at bearing course, 16" inches one (1) course below bearing and 24" inches two (2) courses below bearing, with grout for a minimum 16" inches each side of opening.

G. At steel bearing locations, reinforce masonry with vertical rerod in grouted core, as indicated.

3.14 ENGINEERED (REINFORCED) MASONRY

A. Engineered (reinforced) masonry includes any wall, load bearing or nonload bearing, where vertical reinforcing in CMU cores, or horizontal reinforcing in bond beams, is provided to increase the structural capacity of the wall.

B. Lay masonry units with core cells vertically aligned and cavities between wythes clear of mortar and unobstructed.

C. Reinforce masonry unit cores and cavities with reinforcement bars and grout as indicated.

D. Retain vertical reinforcement in position at top and bottom of cells and at intervals not exceeding 192 bar diameters. Splice reinforcement in accordance with Section 03200.

E. Extend vertical reinforcing continuous through horizontal bond beams.

F. Do not wet masonry unit surfaces in contact with grout prior to grout placement.

G. Grout spaces less than 2" inches in width with fine grout using low lift grouting techniques. Grout spaces 2" inches or greater in width with course grout using high or low lift grouting techniques.

H. When grouting is stopped for more than one hour, terminate grout 1-1/2" inch below top of upper masonry unit to form a positive key for subsequent grout placement.

I. Low Lift Grouting: Place first lift of grout to a height of 24" inches or to three CMU courses and rod for grout consolidation. Place subsequent lifts in 24" inch increments and rod for grout consolidation.

J. High Lift Grouting:

1. Provide cleanout opening no less than 4" inches high at the bottom of each cell to be grouted by cutting one face shell of masonry unit from the concealed surface of the wall.

2. Clean out masonry cells with compressed air, remove debris.

3. Request inspection of the cells and cavities. Allow 3 days advance notice of inspection.

4. After cleaning and cell inspection, seal openings with masonry units.

5. Pump grout into spaces. Maintain water content in grout to intended slump without aggregate segregation.

6. Limit grout lift to 60 inches and rod for grout consolidation. Wait 30 to 60 minutes before placing next lift.

3.15 CONTROL JOINTS

A. Do not continue horizontal joint reinforcement through control and expansion joints.

B. Control joints shall be placed not less than 30'-0" o.c. where not indicated on the plans.

C. Size control joint in accordance with Section 07900 for sealant performance.

3.16 BUILT-IN WORK

A. As work progresses, install built-in metal door and glazed frames, fabricated metal frames, window frames, treated wood nailing strips, anchor bolts, and plates, and other items to be built-in the work and furnished by other sections.

B. Install built-in items plumb and level.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout. Fill adjacent masonry cores with grout minimum 16 inches from framed openings.

D. Do not build in organic materials subject to deterioration.

3.17 TOLERANCES

A. Maintain quality under provisions of Section 01400.

B. Maximum Variation From Alignment of Columns: Pilasters: 1/4" inch

C. Maximum Variation From Unit to Adjacent Unit: 1/32" inch.

D. Maximum Variation from Plane of Wall: 1/4" inch in 10 ft.

E. Maximum Variation from Plumb: 1/4" inch per story non-cumulative.

F. Maximum Variation from Level Coursing: 1/8" inch in 4'-0" ft. and 1/4" inch in 10'-0" ft.

G. Maximum Variation of Joint Thickness: 1/8" inch in 4'-0" ft.

H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4" inch.

3.18 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.19 WATER REPELLENT PENETRANT

A. Verify that joint sealers are installed and cured, and surface to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of coating.

B. Delay work until masonry mortar substrate is cured a minimum of sixty (60) days.

C. Remove loose particles, oil, and foreign matter with chemical solvent which will not affect coating. Scrub and rinse surfaces with water and let dry.

D. Apply coating following manufacturers printed instructions.

E. Protect adjacent surfaces and finishes during coating application.

F. Immediately clean coating from unscheduled surfaces using method instructed by manufacturer.

3.20 CLEANING

A. Clean work under provisions of Section 01700.

B. Remove excess mortar and mortar smears as work progresses.

C. Replace defective mortar. Match adjacent work.

D. Clean soiled surfaces with cleaning solution.

E. Use non-metallic tools in cleaning operations.

3.21 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.

B. Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

END OF SECTION

SECTION 05311

STEEL FLOOR DECK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel floor deck and accessories.

B. Related Sections:

1. Section 03200 - Concrete Reinforcement.

2. Section 03300 - Cast-in-Place Concrete: Concrete topping over metal floor deck.

3. Section 05500 – Metal Fabrications: Supporting angles and anchorage.

4. Section 09900 – Painting: Field finishing exposed steel deck.

1.2 REFERENCES

A. American Society of Civil Engineers:

1. ASCE 3 - Standard Practice for the Construction and Inspection of Composite Slabs.

B. ASTM International:

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

2. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.

3. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

4. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Baked Hardenable.

C. American Welding Society:

1. AWS D1.1 - Structural Welding Code - Steel..

D. Steel Deck Institute:

1. SDI 29 - Design Manual for Composite Decks, Form Decks and Roof Decks.

E. SSPC: The Society for Protective Coatings:

1. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

1.3 PERFORMANCE REQUIREMENTS

A. Design metal deck in accordance with SDI 29 Design Manual and ASCE 3.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal requirements.

B. Shop Drawings: Indicate deck plan, support locations, Projections, openings and reinforcement, pertinent details, and accessories.

C. Product Data: Submit deck profile characteristics and dimensions, structural properties, finishes, and.

D. Manufacturer’s Installation Instructions: Submit manufacturer's installation instructions.

E. Manufacturer’s Certificate: Certify products meet or exceed specified requirements.

F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ASCE 3 for composite decks.

1.6 QUALIFICATIONS

A. Installer: Company specializing in performing Work of this section with minimum years documented experience. approved by manufacturer.

B. Design deck layout, spans, and fastening, and joints under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Michigan.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Product storage and handling requirements.

B. Cut plastic wrap to encourage ventilation.

C. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers:

1. Vulcraft; of type and thickness shown on plans.

2. Or equal

B. Sheet Steel: ASTM A653/A653M, Grade 33 Structural Quality; with G60 galvanized coating.

C. Welding Materials: AWS D1.1.

D. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic.

E. Related deck accessories: Metal closure strips, water stops, etc. of same material and finish as deck, profile as required.

F. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.

PART 3 EXECUTION

3.1 INSTALLATION

A. Erect metal deck in accordance with SDI 29 Manual.

B. Bear deck on masonry support surfaces with 4 inch minimum bearing. Align and level.

C. Bear deck on steel supports with 3 inch minimum bearing. Align and level.

D. Fasten ribbed deck to steel support members at ends and intermediate supports with fusion welds through weld washers at 12 inches oc maximum, parallel with deck flute and at each every other transverse flute.

E. Weld in accordance with AWS D1.1.

F. Mechanically clinch fasten male/female side laps at 24 inches oc maximum.

G. Reinforce steel deck openings from 6 to 18 inches in size with 2 x 2 x 1/4 inch steel angles. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld mechanically attach to deck at each flute.

H. Install wet concrete stops at floor edge upturned to top surface of slab, to contain wet concrete. Install stops of sufficient strength to remain stationary without distortion.

I. Install sheet steel closures and angle flashings to close openings between deck and walls, columns, and openings.

J. Install single row of foam cell closures above walls and partitions perpendicular to deck flutes.

K. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up prime paint.

3.2 FIELD QUALITY CONTROL

A. Welding: Inspect welds in accordance with AWS D1.1.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shop fabricated ferrous metal Items.

1. Loose steel lintels.

2. Misc. framing and supports.

3. Shelf angles.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 05510 – Metal Stairs.

C. Section 05520 – Handrails and Railings.

D. Section 09900 - Painting: Paint finish.

1.3 REFERENCES

A. ASTM A36 - Structural Steel.

B. ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.

C. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

D. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E. ASTM A283 - Carbon Steel Plates, Shapes, and Bars.

F. ASTM A325 – Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

G. ASTM A436 – Specification for Austenitic Gray Iron Castings.

H. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

I. ASTM A563 – Specification for Carbon and Alloy Steel Nuts.

J. ASTM A575 – Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

K. AWS A2.0 - Standard Welding Symbols.

L. AWS D1.1 - Structural Welding Code.

M. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual.

1.4 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

C. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

1.5 SUBMITTALS FOR INFORMATION

A. Welding Filler Material Certificate: Certify that welding filler material meets or exceeds specified requirements.

1.6 QUALIFICATIONS

A. Maintain quality under provisions of Section 01400.

B. Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed by the State of Michigan.

C. Welders Certificates: Submit under provisions of Section 01300, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.1 MATERIALS – STEEL

A. Steel Sections other than wide flange shapes: ASTM A36.

B. Wide Flange Shapes: ASTM A572 or A992 Grade 50.

C. Steel Tubing: ASTM A500, Grade B.

D. Plates: ASTM A283

E. Pipe: ASTM A53, Grade B Schedule 40.

F. Fasteners: Per manufacturer requirements

G. Bolts, Nuts, and Washers: ASTM A325 bolts with heavy hex nuts conforming to ASTM A563 Grade DH, and washers conforming to ASTM F436.

H. Welding Materials: AWS D1.1; type required for materials being welded.

I. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

2.2 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FABRICATION TOLERANCES

A. Maintain tolerances under provisions of Section 01400.

B. Squareness: 1/8" inch maximum difference in diagonal measurements.

C. Maximum Offset Between Faces: 1/16" inch

D. Maximum Misalignment of Adjacent Members: 1/16" inch

E. Maximum Bow: 1/8" inch in 48" inches.

F. Maximum Deviation From Plane: 1/16" inch in 48" inches.

2.4 FINISHES – STEEL

A. Prepare surfaces to be primed in accordance with SSPC SP 2.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime paint items with two coats.

D. Steel Members with exterior exposure: Galvanize after fabrication to ASTM A123. Provide minimum 1.25 oz/sq.ft. galvanized coating.

E. Fasteners for steel with exterior exposure: Galvanized after fabrication to ASTM A153.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site conditions under provisions of Section 1400.

B. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Prepare substrate under provisions of Section 01400.

B. Clean and strip primed steel items to bare metal and aluminum where site welding is required.

C. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components indicated on shop drawings.

D. Perform field welding in accordance with AWS D1.1.

E. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal items to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.

F. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind joints smooth and touch up shop paint coat.

G. Obtain approval prior to site cutting or making adjustments not scheduled.

H. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

I. Setting Loose Plates

1. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

2. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout. use metallic non-shrink grout in concealed locations where not exposed to moisture; use nonmetallic non-shrink grout in exposed locations, unless otherwise indicated.

3. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ERECTION TOLERANCES

A. Maintain tolerances under provisions of Section 01400.

B. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

C. Maximum Offset From True Alignment: 1/4 inch.

D. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05511

METAL STAIRS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel stair frame of structural sections with closed risers.

B. Pan to receive concrete fill.

C. Handrails and railings attached to metal stairs.

D. Handrails attached to walls adjacent to metal stairs.

1.2 RELATED SECTIONS

A. Division 1 General Requirements

B. Section 03300 – Cat-in-Place Concrete: Concrete fill for treads and landings.

C. Section 09900 – Painting: Field finishing of metal stairs.

1.3 REFERENCES

A. ASTM A 36/A 36M-96: Specification for Carbon Structural Steel

B. ASTM A 283/A 283M-93a: Specification for Low and Intermediate Tensile Carbon Steel Plates.

C. ASTM A 500-93: Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

D. ASTM A 1011-A: Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality

E. ASTM A 653/A 653M-96: Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated Galvannealed by the Hot-Dip Process

F. ASTM B 633-85 (Re-approved 1994): Specification for Electrodeposited Coatings of Zinc on Iron and Steel

G. AWS D1.1-96: Structural Welding Code—Steel

H. AWS D1.3-89: Structural Welding Code--Sheet Steel

I. SSPC (Steel Structures Painting Council) – Steel Structures Painting Manual.

J. NAAMM Stair Standard: "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," service or commercial class.

K. NOMMA “Guideline 1 - Joint Finishes”, December 1994.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal stairs and railings capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections.

B. Performance requirements: Stair manufacturer shall engineer and fabricate stairs and railings to comply with requirements of the following, when installed:

1. Treads and Platforms:

a. Uniform load of 100 lbf/sq. ft.

b. Concentrated load of 300 lbf on an area of 4 sq. in.

2. Stair Framing:

a. Tread and platform loads .

b. Railing system loads.

3. Limit deflection of stair members to L/240.

4. Top Rail:

a. Concentrated load of 200 lbf applied at any point and in any direction.

b. Uniform load of 50 lbf/ft. applied in any direction at the top.

5. Handrails:

a. Concentrated load of 200 lbf applied at any point and in any direction.

b. Uniform load of 50 lbf/ft applied in and direction.

6. Intermediate Rails:

a. Concentrated load of 50 lbf applied horizontally on an area equal to 1 sq. ft. including openings and spaces between rails.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's product data substantiating compliance with drawings and specifications.

B. Shop Drawings: Submit shop drawings for stairs and railings. Include plans, elevations and details. Show connection and accessory items, indicate field welds. Show locations for anchor and bolt installation.

C. Include design loads, structural calculations and material properties. Shop drawings shall be signed and sealed by a Structural Engineer licensed in Michigan

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall have produced the types of stair and railing systems required for not less than ten (10) years, with not less than five (5) similar projects that have been in successful use for not less then five (5) years.

B. Installer Qualifications: Minimum five (5) years experience in the successful installation of steel stair and railing systems of the type indicated for this project.

PART 2 PRODUCTS

2.1 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36.

B. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.

C. Rolled Steel Floor Plate: ASTM A 786, rolled from plate complying with ASTM A 36 or ASTM A 283, Grade C or D.

D. Hot-Rolled Steel Sheet: Commercial quality, complying with ASTM A 1011-A.

E. Galvanized Steel Sheet: ASTM A 653, G90 coating, either commercial quality or structural quality, Grade 33.

F. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

G. Primer: Shall be manufacturers fast-curing, lead and chromate-free, universal water reducible primer complying with performance requirements for FS TT-P-664.

2.2 FASTENERS

A. Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 for other applications. Provide fastener type, grade, and class required and recommended by stair manufacturer.

2.3 FABRICATION

A. Exposed Work: True to line and level with accurate angles and surfaces and with straight sharp edges. Use only smooth materials free from burrs, pitting and other marks.

1. Fastener Connections: provide flush close-fit joints at exposed connections.

2. Welded Connections: Exposed welds to have finished appearance in accordance with NOMMA “Guideline 1 - Joint Finishes” for Finish #3.

B. Provide complete stair and landing systems including stringers, landing framing, treads, landings, connections and other components necessary for the support and installation of stairs and landings.

C. Comply with NAAMM “Metal Stairs Manual” requirements for the following Class:

1. Commercial Class Stairs.

D. Stringers:

1. Steel plates

2. Channels as required for compliance with performance requirements

E. Treads:

1. Metal Pan for Cast-in-Place Concrete: Sheet steel tread pan formed for concrete fill, factory-welded to stringers, with all welds on inside of pan to be concealed by field-poured concrete fill.

2. Concrete Fill: Concrete as specified in Section 03300.

F. Nosing: Extruded aluminum nosing, 1/4” thick x 3” deep x width of tread, with slip-resistant abrasive inserts, for shop or field anchorage with anchors of type, size and spacing recommended by stair manufacturer.

G. Risers:

1. Sheet steel

H. Landings: Provide 4” toe plates at open edges of landings. Provide landing type as follows:

1. Metal Pan for Cast-in-Place Concrete: Sheet steel decking pan and factory-installed steel reinforcing bars for field-poured concrete fill; steel channel supports.

2. Concrete Fill: Concrete as specified in Section 03300.

I. Stair Unit Connections: Provide angle brackets, expansion anchors, weld plates and other connection devices as recommended by stair manufacturer for substrates indicated.

2.4 RAILINGS AND HANDRAILS

A. General: Maintain uniform curvature and cylindrical cross-section at each bend.

1. Number of Strands: As required for compliance with specified performance requirements.

2. Vertical Posts: Space posts as required for compliance with specified performance requirements. Provide the following type:

3. Square tubing welded to stringers and offset from railing system.

B. Railing Design:

1. Round Multi-Strand Railing: Multi-strand parallel 1-1/2” round tubular railing, as follows:

2. Connections at Landings: Continuous curved connections for top rail and termination with end caps for lower rails.

3. Wall-Mounted Handrails: 1-1/2” round tubular rail with wall returns, with 1/4” stamped plate wall brackets for exposed fastener; extensions at top and bottom of as required by code.

4. Tube Profile: Round.

2.5 SHOP PAINTING

A. Surface Preparation: SSPC SP-1 Solvent Cleaning, SSPC SP-2 Hand Tool Cleaning and SSPC SP-3 Power Tool Cleaning as required.

B. Shop Primer: Apply shop primer to stairs and railings after fabrication.

1. Primer: Shall be manufacturers fast-curing, lead and chromate-free, universal water reducible primer complying with performance requirements for FS TT-P-664.

2. Dry Film Thickness: 1.0 – 1.3 mil.

PART 3 EXECUTION

3.1 EXAMINATION

A. Installer is responsible to examine conditions, under which metal stairs will be installed for compliance with manufacturer's installation requirements.

3.2 INSTALLATION

A. Install stairs and railings in accordance with manufacturer's instructions and approved drawings and to comply with specified performance requirements when installed.

B. Fit exposed connections accurately together to form close fit joints.

C. Provide anchorage devices and fasteners for securing stairs and railings to in-place construction.

D. Weld connections which cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat.

E. Clean field welds, bolted connections and abraded areas and prime with same material used for shop priming.

3.3 TOUCH UP

A. Touch-up Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09900.

END OF SECTION

SECTION 05520

HANDRAILS AND RAILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Section includes steel pipe railings, balusters, and fittings.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete: Execution requirements for placement of anchors specified in this section in concrete.

B. Section 05510 - Metal Stairs: Handrails other than those specified in this section.

C. Section 09900 - Paints and Coatings: Paint finish.

1.3 REFERENCES

A. ASTM International:

1. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

B. National Ornamental & Miscellaneous Metals Association:

1. NOMMA Guideline 1 - Joint Finishes.

C. SSPC: The Society for Protective Coatings:

1. SSPC - Steel Structures Painting Manual.

2. SSPC Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

1.4 DESIGN REQUIREMENTS

A. Design handrail, guardrail, and attachments to resist forces as required by 2009 Michigan Building Code. Apply loads non-simultaneously to produce maximum stresses.

1. Guard Top Rail and Handrail Concentrated Load: 200 pounds applied at any point in any direction.

2. Guard Top Rail Uniform Load: 50 pounds per linear foot applied in any direction.

3. Intermediate Rails, Panels, and Baluster Concentrated Load: 50 pounds applied to 1 sf area.

1.5 SUBMITTALS

A. Section 01300 - Submittals: Submittal requirements.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1.6 QUALITY ASSURANCE

A. Perform Work for structural aluminum in accordance with AA ADM 1 and AA ASM 35.

B. Finish joints in accordance with NOMMA Guideline 1.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 HANDRAILS AND RAILINGS

2.2 STEEL RAILING SYSTEM COMPONENTS

A. Rails and Posts: 1-1/2 inch diameter steel pipe; welded joints.

B. Fittings: Elbows, T-shapes, wall brackets, escutcheons; cast machined steel.

C. Mounting: Adjustable brackets and flanges, with steel inserts for casting in concrete. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

D. Shop Primer: SSPC Paint 15, Type 1, red oxide.

E. Touch-Up Primer: Match shop primer.

2.3 FABRICATION

A. Fit and shop assemble components in largest practical sizes for delivery to site.

B. Fabricate components with joints tightly fitted and secured. Furnish spigots and sleeves to accommodate site assembly and installation.

C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

E. Interior Components: Continuously seal joined pieces by continuous welds.

F. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

G. Accurately form components to each other and to building structure.

H. Accommodate for expansion and contraction of members and building movement without damage to connections or members.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify field conditions are acceptable and are ready to receive work.

B. Verify concealed blocking and reinforcement is installed and correctly located to receive wall mounted handrails.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete with setting templates, to appropriate sections.

3.3 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Field weld anchors as indicated on shop drawings. Touch-up welds with primer. Grind welds smooth.

C. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.4 ERECTION TOLERANCES

A. Section 01400 - Quality Requirements: Tolerances.

B. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

C. Maximum Offset From Alignment: 1/4 inch.

D. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06112

FRAMING AND SHEATHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preservative treatment of wood.

B. Miscellaneous framing and sheathing.

C. Telephone and electrical panel back boards.

D. Miscellaneous blockings and nailers.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 06114 - Wood Blocking and Curbing.

C. Section 06193 - Plate connected wood Trusses.

1.3 REFERENCES

A. APA (American Plywood Association).

B. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by pressure Processes; American Wood-Preservers' Association; 2000.

C. PS 1 - Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce); 1995.

D. PS 20 - American Softwood Lumber Standard; National institute of Standards and Technology (Department of commerce); 1999.

E. NLGA (GR) - Standard Grading Rules for Canadian Lumber; National Lumber Grades Authority; 1991.

F. SPIB (GR) - Standard Grading Rules for Southern Pine Lumber; Southern Pine Inspection Bureau, Inc.; 1994.

1.4 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01300.

B. Product Data: Provide technical data on wood preservative materials, and application instructions, include manufacturers on site storage requirements.

1.5 SUBMITTALS FOR INFORMATION

A. Submit under provisions of Section 01300.

B. Manufacturer's Certificate: Certify that Products conform to specified requirements.

1.6 QUALITY ASSURANCE

A. Maintain quality work under provisions of Section 01400.

B. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.

C. In lieu of grade stamping exposed to view lumber and plywood, submit manufacturer's certificate certifying that products meet or exceed specified requirements.

D. Design structural shop fabricated systems under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Michigan.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Transport, handle, store, and protect products under provisions of Section 01600.

B. Store all materials per Manufacturer’s recommendations.

PART 2 PRODUCTS

2.1 DIMENSION LUMBER

A. Grading Agency: National Lumber Grades Authority (NLGA).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content; S-dry or MC19.

D. Stud Framing (2 x 2 through 2 x 6): Spruce-Pine-Fir; No. 2 or better.

E. Wall top plates and sill plates: Southern Yellow Pine; No. 2 or better.

F. Post, Beam, Joist, and Rafter Framing (2 x 6 through 4 x 16): Spruce-Pine-Fir; No. 2 or better.

G. Miscellaneous Blocking, Furring, and Nailers:

1. Lumber: S4S, No. 2 or Standard Grade.

2. Boards: Standard or No. 3.

3. Pressure Preservative Treated Framing (2 x 2 through 4 x 16): Southern Yellow Pine; No 2 or better.

2.2 ENGINEERED LUMBER PRODUCTS

A. Beams and Headers as indicated on Plans.

B. Provide Gang-Lam LVL 2950Fb-2.0E as manufactured by LP Engineered Wood Products

1. Modulus of elasticity: 2,000,000 psi

2. Flexural stress: 2,950 psi

3. Compression perpendicular to grain parallel to wide face of strands: 1020 psi

4. Compression parallel to grain: 3,200 psi

5. Horizontal shear perpendicular to wide face of strands: 290 psi

C. Sizes: As indicated on Plans.

2.3 CONSTRUCTION PANELS

A. APA Rated Roof Sheathing: Exposure 12, and as follows:

1. Span Rating: 32/16.

2. Thickness: 5/8 inches.

3. Edges: Square.

B. APA Rated Wall Sheathing: Exposure 1, and as follows:

1. Span Rating: 24/0.

2. Thickness: 1/2 inches

3. Edges: Square

2.4 ACCESSORIES

A. Fasteners and Anchors:

1. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.

2. Anchors: Epoxy screen tube and bolt type for anchorage to hollow masonry, epoxy and bolt type for anchorage to solid masonry or concrete and bolt for anchorage to steel.

B. Hangers, Clips, and Connectors: Hot dipped galvanized steel, sized to suit framing conditions, as indicated.

C. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls in longest possible lengths.

D. Secondary Moisture Barrier: As specified in Section 07270.

2.5 FACTORY WOOD TREATMENT

A. Wood Preservative Pressure Treatment: AWPA Treatment C2 for lumber, and C9 for plywood using water borne preservative with 0.25 percent retainage. Following treatment, kiln dry lumber and plywood to maximum moisture content, 19% (lumber and 15% (plywood).

B. Wood Preservative Surface Application: Clear type of same chemical composition as treatment.

C. Provide treated lumber for all items indicated by "P.T.", "TRT-WD" or "Treated" and wood cants, nailers, curbs, blocking, stripping and other material in connection with roofing, flashing and waterproofing, wood sills, sleepers, blocking, nailers, furring, stripping or other concealed members in contact with steel, masonry or concrete.

PART 3 EXECUTION

3.1 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes.

E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.

F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

G. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.

H. Frame openings with two or more full height studs at each jamb; support headers on cripple studs.

I. Provide miscellaneous members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.2 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing: Secure panels perpendicular to framing members, with ends staggered and sheet ends over firm bearing.

1. Prior to installing sheathing verify that roof framing is true and square. Install blocking and shims to provide flat, even roof surface for shingle installation.

2. Install panels continuous over two or more spans.

3. Nail panels to framing; staples are not permitted.

B. Wall Sheathing: Secure with long dimension parallel to wall studs, with ends and edges over firm bearing, using nails.

1. Place secondary moisture barrier over wall sheathing, weather lapping edges and ends.

2. Install panels continuous over two or more spans.

3. Nail panels to framing; staples are not permitted.

3.3 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment in accordance with manufacturer's instructions.

B. Brush apply one heavy coat of preservative treatment on wood. Treated site-sawn cuts.

C. Allow preservative to dry prior to erecting members.

3.4 TOLERANCES

A. Maintain tolerances under provisions of Section 01400.

B. Framing Members: 1/4" inch from true position, maximum.

END OF SECTION

SECTION 06114

WOOD BLOCKING AND CURBING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Miscellaneous wood blocking for support of equipment.

B. Preservative treatment of wood.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 06112 - Framing and Sheathing

1.3 REFERENCES

A. AFPA WCD No. 1 - Manual for Wood Frame Construction; American Forest and Paper Association; 1988.

B. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by pressure Processes; American Wood-Preservers' Association; 2000.

C. PS 1 - Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce); 1995.

D. PS 20 - American Softwood Lumber Standard; National institute of Standards and Technology (Department of commerce); 1999.

E. NLGA (GR) - Standard Grading Rules for Canadian Lumber; National Lumber Grades Authority; 1991.

F. SPIB (GR) - Standard Grading Rules for Southern Pine Lumber; Southern Pine Inspection Bureau, Inc.; 1994.

1.4 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01300.

B. Product Data: Provide technical data on wood preservative materials.

1.5 SUBMITTALS FOR INFORMATION

A. Submit under provisions of Section 01300.

B. Product Data: Provide application instructions on wood preservative materials.

1.6 QUALITY ASSURANCE

A. Maintain quality under provisions of Section 01400.

B. Lumber: Comply with PS-20 and approved grading rules and inspection agencies.

PART 2 PRODUCTS

2.1 MATERIALS

A. Lumber Grading Rules: National Lumber Grading Authority (NLGA).

B. Miscellaneous Framing: S4S, NO. 2 or standard grade.

2.2 ACCESSORIES

A. Fasteners and Anchors:

1. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.

2. Anchors: Epoxy screen tube and bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete and bolt or ballistic fastener for anchorages to steel.

2.3 FACTORY WOOD TREATMENT

A. Wood Preservative (Pressure Treatment): AWPA Treatment C2 for lumber, and C9 for plywood using water borne preservative with 0.25 percent retainage. Following treatment, kiln dry lumber and plywood to maximum moisture content, 19% (lumber and 15% (plywood).

B. Wood Preservative Surface Application: Clear type of same chemical composition as treatment.

C. Provide treated lumber for all items indicated by "P.T.", "TRT-WD" or "Treated" and wood cants, nailers, curbs, blocking, stripping and other material in connection with roofing, flashing and waterproofing, wood sills, sleepers, blocking, nailers, furring, stripping or other concealed members in contact with masonry or concrete.

PART 3 EXECUTION

3.1 FRAMING

A. Set members level and plumb, in correct position.

B. Place horizontal members, crown side up.

C. Construct curb members of single pieces.

D. Space framing and furring 16" inches o.c.

E. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.

F. Coordinate curb installation with installation of decking and support of deck openings, roofing vapor retardant, parapet construction.

3.2 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment in accordance with manufacturer's instructions.

B. Brush apply two coats of preservative treatment on wood in contact with cementitious materials, roofing and related metal flashing.

C. Allow preservative to dry prior to erecting members.

END OF SECTION

SECTION 06193

PLATE CONNECTED WOOD TRUSSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shop fabricated wood trusses.

B. Bridging, bracing, and anchorage.

C. Preservative treatment of wood.

1.2 RELATED SECTIONS

A. Division 1 - General Requirements

B. Section 06112 - Framing and Sheathing. Placement of bearing plates.

C. Section 06114 - Wood Blocking and Curbing:

1.3 REFERENCES

A. TPI Standards: Comply with applicable requirements and recommendations of the following Truss Plate Institute (TPI) publications:

1. “Design Specifications for Metal Plate Connected Wood Trusses”

2. “Commentary and Recommendations for Handling and Erecting Wood Trusses”

3. “Commentary and Recommendations for Bracing Wood Trusses”

4. “Quality Standard for Metal Plate Connected Wood Trusses”

5. Wood Structural Design Standard: Comply with applicable requirements of “National Design Specification for Wood Construction” published by A.F.P.A.

1.4 QUALITY ASSURANCE

A. Design by Manufacturer: Trusses shall be designed by Connector-plate manufacturer to support all superimposed dead and live loads indicated, with design approved and certified by a structural Engineer licensed to practice in the jurisdiction where trusses will be installed.

B. Connector Plate Manufacturer’s Qualifications: Provide truss connector plates manufactured by a firm which is a member of TPI and which complies with TPI quality control procedures for manufacture of connector plates published in TPI “Quality Standard for Metal Plate Connected Wood Trusses”.

C. Fabricator’s Qualifications: Provide trusses by a firm which has a record of successfully fabricating trusses similar to type indicated and which complies with the folliowing requirements for control:

1. Fabricator participates in TPI “Qaulity Assurance Insepction Program” as a licensee authorized to apply TPI marks to trusses.

2. Fabricator practices a quality control program with complies with, or is comparable to, one published in TPI “Qaulity Standard for Metal Plate Connected Wood Trusses” and which involves inspection by an independent inspection and testing agency acceptable to the Architect and authorities having jurisdiction.

D. Provide connector plates from a single manufacturer.

1.5 SYSTEM DESCRIPTION

A. Design Roof Live and Dead Load: With deflection limited to 1/240 of span.

1. Design Load as shown on plans.

2. Mechanical Unit Point Loads (each unit).

1.6 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01300.

B. Product Data: Provide truss configurations, bearing and anchor details, bridging and bracing.

C. Manufacturer’s Certification: Certify that trusses supplied for the project comply with indicated requirements.

D. Shop Drawings:

1. Indicate sizes and spacing of trusses and associated components, web and chord sizes, plate sizes, fastener descriptions and spacings, bearing surface area requirements, loads and truss cambers, framed openings, temporary and permanent bridging, lateral bracing and cross bracing.

2. Submit design calculations.

3. Shop drawings shall bear the Seal of the Supervising Professional Structural Engineer.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for loads, seismic zoning, other governing load criteria, and fire retardant requirements.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Transport, handle, store, and protect products under provisions of Section 01600.

B. Handle and erect trusses in accordance with TPI recommendations.

C. Store truss depth in vertical position resting on intermittent bearing pads of ground, protected from weather by plastic sheet, tarpaulins, or other protective covering.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide metal connector plates of one of the following:

1. Alpine Engineered Products, Inc.

2. Clary Corporation

3. Gang Nail Systems, Inc.

4. Hydro-Air Engineering, Inc.

5. Inter-Lock Steel Co., Inc.

6. Link-Wood Construction Systems

7. Lumbermate Company

8. Robbins Manufacturing Co.

9. The Panel-Clip Company

10. Tee-Lok Corp.

11. Truss Connector of America

12. Truswal Systems Corp.

2.2 DESIGN

A. Trusses shall be designed for loads listed on Plans. If loads are not listed, truss designer shall design trusses per ASCE 7-02 “Minimum Design Loads for Building and Other Structures”.

B. Truss shall be designed for a maximum of 425 psi allowable bearing pressure. Truss manufacturer shall include and attach heel blocks or other approved bearing enhancement as necessary to achieve this requirement.

C. Unless listed otherwise on the plans, truss manufacturer shall design and provide all truss to truss hangers. Hangers shall be able to support horizontal and vertical reactions including uplift.

2.3 LUMBER

A. Factory mark each piece of lumber with type, grade, mill and grading agency.

B. Lumber Standard: Manufacture lumber to comply with PS 20 “American Softwood Lumber Standard” and with applicable grading rules on inspection agencies certified by American Lumber Standards Committee (ALSC) Board of review.

C. Inspection Agencies: Inspection agencies and the abbreviations used to reference them to lumber grades and species include the following:

1. NLGA – National Lumber Grades Authority (Canadian)

2. SPIB – Southern Pine Inspection Bureau.

3. WCLIB – West Coast Lumber Inspection Bureau.

4. WWPA – Western Wood Products Association

5. Nominal sizes are indicated, except as shown by detail dimensions.

D. Provide lumber manufactured to actual sizes required by PS 20 to comply with requirements indicated below:

1. Dresses, S4S, unless otherwise indicated.

2. Moisture Content: Seasoned, with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.

3. Grade: Per Truss Designer's specifications.

4. Species: Any species graded under WWPA, NLGA, SPIB, or WCLIB rules.

2.4 METAL CONNECTOR PLATES

A. Connector Plates: Fabricate connector plates from metal complying with the following requirements:

1. Hot-Dip Galvanized Steel Sheet: Structural (physical) quality of steel sheet complying with ASTM A446, Grade A; zinc coated by hot-dip process to comply with ASTM A525, Designation G60; minimum coated metal thickness indicated but not less than 0.036".

2.5 ACCESSORIES

A. Wood Blocking Support Members Framing for Openings: As specified in Section 06114.

B. Fasteners and Anchors:

1. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.

C. Bearing Plates: Wood, plain steel or as indicated.

D. Truss uplift straps: as detailed on drawings.

E. Miscellaneous straps and anchors: Provide as indicated on the drawings.

2.6 FABRICATION

A. Wood truss fabrication shall comply with TPI 1 "National Design Standard for Metal Plate Connected Wood Truss Construction".

B. Fabricate trusses to achieve structural requirements specified.

C. Cut truss members to accurate lengths, angles, and sizes to produce close fitting joints with wood to wood bearing in assembled units.

D. Fabricate metal connector plates to size, configuration, thickness and anchorage details required for types of joint designs indicate.

E. Assemble truss members in design configuration indicated using jigs or other means to ensure uniformity and accuracy of assembly with close fitting joints. Position members to produce design camber indicated.

F. Connect trusses by means metal connector plates accurately located and securely fastened to each side of wood members by means indicated or approved.

G. Provide bottom and top chord extensions as indicated.

H. Frame special sized openings in web framing as detailed.

I. Fabricate considering individual mechanical unit loads.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions under provisions of section 01400.

B. Verify that supports and openings are ready to receive trusses.

3.2 PREPARATION

A. Prepare substrate under provisions of Section 01400.

B. Coordinate placement of bearing and support items.

3.3 ERECTION

A. Do not install damaged trusses, damaged webs, cords, loose gusset plates, etc.

B. Install trusses in accordance with manufacturer's instructions and TPI recommendations.

C. Set members level and plumb, in correct position.

D. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.

E. During the entire construction period, all contractors shall provide means for adequate distribution of concentrated load so that the safe loading capacity of any one truss or other component is not compromised.

F. Do not field cut or alter structural members without written approval of Architect/Engineer. Trusses that are cut, notched or otherwise altered shall be repaired as directed by the Truss Designer at the Contractor’s expense.

G. During erection care shall be exercised to keep horizontal bending of the trusses to a minimum.

H. Install truss uplift straps where indicated. At each truss bearing point where not shown, install per manufacturer's recommendations.

I. Place headers and supports to frame openings.

J. Install permanent bracing and related components to enable trusses to maintain design spacing, withstand live and dead loads including lateral loads, and to comply with other indicated requirements. As a minimum, the Contractor shall install pairs of 2x4 chevron bracing at maximum 20 foot intervals at all truss webs requiring permanent lateral bracing. The bracing shall be installed in the plane of the webs and nailed to each web member with two sixteen penny nails minimum. Chevron bracing angle shall be approximately 45 degrees in the plan of the web and shall be in addition to the permanent lateral bracing. Alternatively, the Contractor may use T of L bracing on any member requiring bracing. T or L bracing shall be in compliance with BCSI recommendations.

K. Frame openings between trusses with lumber in accordance with Section 06112.

L. Coordinate placement of sheathing with work of this section.

M. After erection, touch-up damaged surfaces with primer consistent with shop coat.

3.4 ERECTION TOLERANCES

A. Framing Members: 1/2 inch maximum, from true position.

B. Trusses: 1/4 inch maximum from true position; 1/4 inch maximum from plumb.

END OF SECTION

SECTION 06200

FINISH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Reception Counters.

B. Finish Carpentry Items, other than Manufactured Casework.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 12300 – Manufactured Casework: Cabinets in conjunction with Reception Counters.

1.3 RELATED SECTIONS

A. Division I - General Requirements

B. Section 07900 - Joint Sealers.

C. Section 06112 – Framing and Sheathing: Knee wall framing materials.

D. Section 06114 – Wood Blocking and Curbing: Grounds and support framing.

E. Section 09900 - Painting: Painting and finishing of finish carpentry items.

F. Section 12300- Manufactured Casework: Cabinets in conjunction with Reception Counter.

G. Division 16000 - Electrical: Power distribution devices and wiring.

1.4 REFERENCES

A. ANSI A208.1 - Mat Formed Wood Particleboard.

B. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

C. AWI - Quality Standards.

D. AWPA (American Wood Preservers Association) C2 - Lumber, Timbers, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes.

E. AWPA (American Wood Preservers Association) C20 - Structural Lumber Fire Retardant Treatment by Pressure Process.

F. FS MMM-A-130 - Adhesive, Contact.

G. NEMA (National Electric Manufacturers Association) LD3 - High Pressure Decorative Laminates.

H. NHLA (National Hardwood Lumber Association).

I. PS 20 - American Softwood Lumber Standard.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Submit complete shop drawings by approved fabricators for proposed millwork items requiring shop fabrication process.

C. Product Data: Provide product data for purchased items installed in millwork prior to delivery on fire retardant treatment materials and application instructions.

D. Provide instructions for attachment hardware, and finish hardware.

E. Samples: Submit two samples of finish plywood for transparent finish, 12 inches x 12 inches in size illustrating wood grain for each species and cut.

F. Submit two samples of wood trim or paneling for transparent finish 12 inches long for each species and cut.

1.6 QUALITY ASSURANCE

A. Maintain quality under provisions of Section 01400.

B. Perform work in accordance with AWI Custom quality.

1.7 QUALIFICATIONS

A. Maintain quality under provisions of Section 01400.

B. Fabricator: Company specializing in fabricating the products specified in this section with minimum three years documented experience.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire retardant requirements.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Transport, deliver, store, protect and handle products to site under provisions of Section 01600.

B. Protect work from moisture damage.

1.10 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated in construction drawings.

1.11 COORDINATION

A. Coordinate work under provisions of Section 01039.

B. Coordinate the work with electrical rough-in, installation of associated and adjacent components.

PART 2 PRODUCTS

2.1 LUMBER MATERIALS

A. Softwood Lumber Standards: Comply with PS 20 and with applicable grading rules of the respective grading and inspecting agency for the species and product indicated.

B. Hardwood Lumber Standard: Graded in accordance with AWI Custom Grade.

2.2 LUMBER MATERIALS

A. Harwood Lumber for Transparent Finish (Stained or Clear): Red oak species, maximum moisture content of 8 percent; with plain sawn grain, of quality suitable for transparent finish.

B. Softwood Lumber for Transparent Finish: Fir species, plain sawn maximum moisture content of 6 percent, of quality suitable for transparent finish.

C. Lumber for Painted Finish: Pine species, plain sawn maximum moisture content of 6 percent, of quality suitable for paint finish. At Contractor option, use pieces which are either glued-up lumber or made from solid lumber stock.

2.3 SHEET MATERIALS

A. Wood Particleboard: ANSI 208.1 Type 1; AWI standard, composed of wood chips, medium density, made with high waterproof resin binders; of grade to suit application; sanded faces.

2.4 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: Comply with the requirements of "Publication No. LD1" by the National Electrical Manufacturer's Association (NEMA). Provide laminate of color, pattern and texture as selected.

1. Horizontal Surfaces: NEMA General-Purpose Type, nominal 0.62" thickness.

2. Post-Formed Surfaces: NEMA Post-forming type, nominal 0.050" thickness.

3. Vertical Surfaces: NEMA Vertical-Surface type, nominal 0.032" thickness.

B. Laminate Backing Sheet: NEMA LD-3 BK20 backing grade, undecorated plastic laminate.

2.5 ADHESIVE

A. Adhesive: FS MMM-A-130 contact adhesive. Type recommended by laminate manufacturer to suit application.

2.6 FASTENERS

A. Fasteners: Of size and type to suit application.

B. Concealed Joint Fasteners: Threaded steel.

2.7 ACCESSORIES

A. Lumber for Shimming and Blocking: Softwood lumber of any species.

B. Sealant for backsplash to counter joint (as specified in Section 07900 - Joint Sealers).

C. Wood Filler: Solvent base, tinted to match surface finish color.

D. Aluminum Standoffs: 1-1/2" diameter x length indicated, aluminum standoff equal to Standoff Systems Basic Standoff.

2.8 FACTORY WOOD TREATMENT

A. Wood Preservative Pressure Treatment: AWPA Treatment C2 for lumber, and C9 for plywood using water borne preservative with 0.25 percent retainage. Following treatment, kiln dry lumber and plywood to maximum moisture content, 19% (lumber and 15% (plywood),

B. Wood Preservative Surface Application: Clear type of same chemical composition as treatment.

C. Provide treated lumber for all items indicated by "P.T.", "TRT-WD" or "Treated" and wood cants, nailers, curbs, blocking, stripping and other material in connection with roofing, flashing and waterproofing, wood sills, sleepers, blocking, nailers, furring, stripping or other concealed members in contact with steel, masonry or concrete.

2.9 FABRICATION

A. Fabricate to AWI Custom standards.

B. Shop assemble work for delivery to site, permitting passage through building openings.

C. Cap exposed plastic laminate finish edges with trim as indicated.

D. Shop prepare and identify components for book match grain matching during site erection.

E. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

F. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Locate counter butt joints minimum 2 feet from sink cut-outs.

G. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

2.10 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler which matches surrounding surfaces and of types recommended for applied finishes.

D. Seal, stain and varnish exposed to view surfaces. Brush apply only.

E. Seal, stain and varnish semi-exposed to view surfaces. Brush apply only.

F. Seal surfaces in contact with cementitious materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site conditions under provisions of Section 01400.

B. Verify adequacy of backing and support framing.

C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 INSTALLATION

A. Install work in accordance with AWI Custom Quality Standard.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

D. Install components and trim with nails, screws, bolts with blind fasteners as indicated.

E. Install board paneling with nails and wall adhesive by the bead method.

F. Install hardware supplied in accordance with manufacturer's instructions.

3.3 PREPARATION FOR SITE FINISHING

A. Prepare substrate under provisions of Section 01400.

B. Site Finishing: Refer to Section 09900.

C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

D. Prior to installing exterior trim prime and/or back paint concealed surfaces to seal and protect wood against degradation by moisture.

3.4 ERECTION TOLERANCES

A. Maintain tolerances under provisions of Section 01400.

B. Maximum Variation from True Position: 1/16 inch.

C. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

3.5 SCHEDULE

A. Interior:

1. Window casing and trim: Clear fir selected to match graining of window frames; prepare for transparent finish.

2. Running trim (molding) at gypsum board ceilings and masonry to gypsum wall transitions: Clear pine; prepare for paint finish.

3. Casing and trim in connection with reception counter: Plain sliced red oak; prepare for transparent finish.

END OF SECTION

SECTION 06625

SOLID PLASTIC FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cast plastic window stools.

1.2 RELATED SECTIONS

A. Division 1 - General Requirements

B. Section 07900 - Joint Sealers: Perimeter sealant to adjacent construction.

1.3 REFERENCES

A. ASTM E84 - Surface Burning Characteristics of Building Materials.

B. NFPA 70 - National Electrical Code.

C. UL - Underwriters Laboratories Inc., Fire Resistance Directory.

1.4 DESIGN REQUIREMENTS

A. Design stools items with sufficient strength for handling and placement stresses.

1.5 SUBMITTALS FOR APPROVALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate dimensions, thicknesses, required clearances, tolerances, materials, colors, finishes, fabrication details, field jointing, adjacent construction, and design load parameters.

C. Product Data: Provide data on specified component products, electrical characteristics and connection requirements.

D. Samples: Submit two (2) samples representative of window stools, 6 x 6 inch in size illustrating color, texture, and finish.

E. Manufacturer's Installation Instructions: Indicate preparation of opening required, rough-in sizes.

1.6 SUBMITTALS FOR CLOSE-OUT

A. Submit under provisions of Section 01700.

B. Maintenance Data: Indicate list of approved cleaning materials and procedures required; list of substances that are harmful to the component materials.

C. Include instructions for stain removal, surface and gloss restoration.

D. Warranty: Submit manufacturer’s warranty as specified.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable codes for flame/smoke rating of 35/15 for a thickness of 3/4 inch in accordance with ASTM E84 requirements.

1.9 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings instructed by the manufacturer.

1.10 WARRANTY

A. Provide five year warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. DuPont Company, FP Department, Wilmington, DE; Product: Corian.

B. Or equal.

2.2 MATERIALS

A. Solid, homogeneous filled material containing methyl methacryiate.

2.3 FABRICATION

A. Fabricate stools to shape as indicated.

B. Gel coat finish exposed surfaces smooth and polish to a low sheen.

C. Radius corners and edges as indicated.

D. Cure components prior to shipment, except sheet materials requiring site handling.

2.4 FINISH

A. Color: Color as selected.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site conditions under provisions of Section 01400.

B. Verify that joint preparation and affected dimensions are acceptable.

3.2 INSTALLATION

A. Install components in accordance with shop drawings and manufacturer's instructions.

B. Align work plumb and level.

C. Rigidly anchor to substrate to prevent misalignment.

3.3 TOLERANCES

A. Maintain tolerances under provisions of Section 01400.

B. Maximum Variation From True Dimension: 1/16" inch

C. Maximum Offset From True Position: 1/16" inch.

3.4 CLEANING

A. Clean work under provisions of Section 01700.

B. Clean and polish fabrication surfaces in accordance with manufacturer's instructions.

3.5 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.

B. Do not permit construction near unprotected surfaces.

3.6 MAINTENANCE MATERIALS

A. Provide maintenance materials under provisions of Section 01700.

END OF SECTION

SECTION 07212

BOARD INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Board insulation at perimeter foundations.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 04300 - Unit Masonry Systems: Board insulation in connection with cavity walls.

1.3 REFERENCES

A. ASTM C272 - Water Absorption of Core Materials for Structural Sandwich Constructions.

B. ASTM C578 - Preformed, Extruded Polystyrene Thermal Insulation.

1.4 SYSTEM DESCRIPTION

A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements in conjunction with thermal insulating materials in other Sections.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on product characteristics, performance criteria, and limitations.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions under provisions of Section 01400.

B. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.7 SEQUENCING

A. Sequence work under the provisions of Section 01400.

B. Sequence work to ensure substrate materials are in place before beginning the Work of this section.

PART 2 PRODUCTS

2.1 MANUFACTURERS - RIGID INSULATION MATERIALS

A. DOW Chemical; Product - Styrofoam Square Edge

B. VC Industries, Inc.; Product - Foamular 250

C. AMOCO Foam Products Co.; Product - Amofoam CM

D. Or equal.

2.2 MATERIALS

A. Extruded Polystyrene Insulation for foundation perimeter insulation. ASTM C578 type IV conforming to the following:

1. Board Thickness: 2 inches.

2. Thermal Resistance: Minimum R value of 5 per inch of thickness.

3. Water Absorption: In accordance with ASTM C272 .1 percent by volume maximum.

4. Compressive Strength: Minimum 25 psi.

5. Board Edges: Square edges.

2.3 ACCESSORIES

A. Adhesive Mastic: Equal to Contech Brands "PL300" or H.B. Fuller "MaxBond" for application to CMU for perimeter insulation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site conditions under provisions of Section 01400.

B. Verify that substrate, adjacent materials, and insulation boards are dry and ready to receive insulation and adhesive.

C. Verify substrate surface is flat, free of fins, irregularities, materials or substances that may impede adhesive bond.

3.2 INSTALLATION - FOUNDATION PERIMETER

A. Apply adhesive in three continuous beads per board length.

B. Install boards on inside face of foundation wall full perimeter.

1. Place boards in a method to maximize contact bedding.

2. Stagger end joints.

3. Butt edges and ends tight to adjacent board and to protrusions.

C. Extend boards over control joints, unbonded to foundation 8 inches on one side of joint.

D. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

3.3 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.

B. Do not permit work to be damaged prior to or during backfilling operations.

END OF SECTION

SECTION 07213

BATT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Batt Insulation for wall cavities.

B. Batt Insulation for vertical applications in attic.

C. Batt insulation for filling perimeter window and door shim spaces, crevices in exterior wall and roof.

D. Semi-rigid batt insulation for installation on wall surfaces in soffits.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 07217 - Blown Insulation

C. Section 07260 – Vapor Retarders: Vapor retarders used in connection with unfaced batt insulation.

1.3 REFERENCES

A. ASTM C665 - Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

1.4 SYSTEM DESCRIPTION

A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements in conjunction with thermal insulating materials in Section 07217.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on product characteristics, performance criteria, and limitations.

PART 2 PRODUCTS

2.1 MATERIALS

A. Batt Insulation for wall cavities: ASTM C665; preformed glass fiber batt or roll, conforming to the following:

1. Thickness: 5-1/2 inches

2. Thermal Resistance: R-19.

3. Facing: Kraft paper faced.

B. Batt insulation for vertical applications in attic: ASTM C665; preformed glass fiber batt or roll conforming to the following:

1. Thickness: 12 inches.

2. Thermal Resistance: R-38.

3. Facing: Unfaced.

C. Batt Insulation for fill at windows, door shim spaces, crevices in wall and roof framing: ASTM C665; preformed glass fiber batt; friction fit, conforming to the following:

1. Thermal Resistance: R of 3.75 per inch of thickness.

D. Semi-rigid batt insulation for installation on surface of walls in soffits: ASTM C665; preformed mineral fiber semi-rigid batt; equal to Versa Board 40 as manufactured by Thermafiber, conforming to the following:

1. Thickness: 1-1/2 inches.

2. Thermal Resistance: R - 4.2 per inch of thickness.

3. Density: 4.0 PCF

4. Facing: Unfaced.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site conditions under provisions of Section 01400.

B. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

3.2 INSTALLATION

A. Install insulation in accordance with insulation manufacturer's instructions.

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces.

D. Insulate miscellaneous gaps and voids around doors and windows with cut pieces and cover with vapor retarder under Section 07260.

E. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.

END OF SECTION

SECTION 07214

FOAM INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Foam insulation pneumatically placed in cores in masonry walls separating conditioned from unconditioned space through access holes.

1.2 RELATED SECTIONS

A. Section 04100 - Mortar & Masonry Grout: Establish access holes close and repair same.

B. Section 04300 - Unit Masonry Systems

1.3 REFERENCES

A. ASTM E-90-90 - Acoustic Properties.

1.4 SYSTEM DESCRIPTION

A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements with work of other Sections.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on product characteristics, performance criteria, and limitations.

C. Manufacturer's Installation Instructions: Indicate procedure for preparation and installation.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.6 COORDINATION

A. Coordinate work under provisions of Section 01039.

B. Coordinate insulation installation with reinforcement placing and core grouting under Section 04300.

1.7 INSTALLER

A. Company specializing in performing the work of this section with minimum three (3) years documented experience and as approved by manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS - INSULATION MATERIALS

A. Tailored Chemical Products, Inc., P.O. Box 4186, Hickory, North Carolina 28603 Ph: 1-800-627-1687. Product: Core-Fill 500.

B. Substitutions: Under provisions of Section 01600.

2.2 MATERIALS

A. Foam Insulation: Core-fill 500; Amino-Plast & Catalyst Foaming Agent, Surfactant propelled by compressed air.

2.3 PROPERTIES / PERFORMANCE

A. Thermal Properties:

1. Insulation Value: Parallel Heat Flow.

2. Construction: 8" inch block/60 lbs. Density

3. "U" Value: 0.07

4. "R" Value: 14.2

B. Properties (continued):

Test/Property	Reference	Required Performance	Core-Fill 500
Thermal Resistivity	DOE (e) (2) HUD 6.2.7	Not less than 4.0 per inch	4.9 per inch
Fire Safety	DOE (e) (2) HUD 6.2.10	Flame spread not to exceed 25	Fuel contribution 0 *Flame spread 15 Smoke density 75
Fire Wall Rating	ASTM E-119-88	Minimum - 2 hours	4 hrs. on 12" CMU 4 hrs. on 8" CMU
Corrosiveness	DOE (e) (3) HUD 6.2.8	Al,Cu,Steel-No Perforations Galv. Steel - No Pitting Loss of mass not to exceed 0.2g	No Perforations No Pitting Less than 0.1g
Density	DOE (C) (4) HUD 6.1.4	Dry 0.7 to 0.9 lb/ft3 Dry 2.5 to 5.5 lb/ft3	0.8 lb/ft3 2.7 to 3.3 lb/ft3
Water Absorption	DOE (e) (8) HUD 6.2.2	Not to exceed 15% No absorp. in less than one hour	Floating test 3% Droplet test 1 hr., 15 min.
Setting Time	DOE (e) (8) HUD 6.2.2	20-60 seconds	21 seconds
Volume Resistivity	DOE (e) (10) HUD 6.2.3	Not less than 5000 ohm/cm	43000 ohm/cm
Water Drainage	DOE (e) (10) HUD 6.2.4	No Leakage	No Leakage
Shrinkage	DOE (e) (11) HUD 6.2.5	Not more than 4.0%	Less than 1%

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01400.

B. Verify that substrate, adjacent materials, are dry and ready to receive insulation

C. Verify spaces are unobstructed to allow placement of insulation.

3.2 INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Drill access holes in masonry wall mortar joints to permit equipment access as recommended by manufacturer.

C. Place insulation under pressure, tight in masonry core to a density of 2.7 to 3.3 lb/ft3.

D. Completely fill intended spaces. Leave no gaps or voids.

E. Repair and reseal insulation access ports. Refinish to match disturbed work.

3.3 CLEANING

A. Clean work under provisions of 01700.

B. Remove loose insulation residue.

END OF SECTION

SECTION 07217

BLOWN INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Loose insulation pneumatically placed or poured into truss spaces.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 07212 – Board Insulation

C. Section 07213 - Batt Insulation

D. Section 07260 – Vapor Retarders

1.3 REFERENCES

A. ASTM C764 - Mineral Fiber Loose Fill Insulation.

1.4 SYSTEM DESCRIPTION

A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements, in conjunction with work of other Sections.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on product characteristics, performance criteria, and limitations.

PART 2 PRODUCTS

2.1 MATERIALS

A. Fiber Fill Insulation: ASTM C764, glass fiber type, bulk for pneumatic placement, total R value of 38.00 in place.

2.2 ACCESSORIES

A. Insulation Baffles: Formed insulation baffles of semi-rigid board, specifically designed and approved for exposed installation in attic spaces.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify conditions under provisions of Section 01400.

B. Verify that substrate, adjacent materials, and insulation are dry and ready to receive

insulation.

C. Verify spaces are unobstructed to allow placement of insulation.

3.2 INSTALLATION

A. Install insulation baffles between trusses to maintain open airway for attic ventilation.

B. Install insulation in accordance with manufacturer's instructions.

C. Place insulation pneumatically, tight in truss spaces to achieve a minimum in-place R value of 38.

D. Place against and behind mechanical and electrical services within the plane of insulation.

E. Completely fill intended spaces. Leave no gaps or voids.

3.3 CLEANING

A. Clean work under provisions of Section 01700.

B. Remove loose insulation residue.

END OF SECTION

SECTION 07240

EXTERIOR INSULATION AND FINISH SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Composite wall cladding of rigid insulation and applied coating.

1.2 RELATED SECTIONS

A. Division 1 - General Requirements

B. Section 04300 - Unit Masonry Systems: Wall substrate construction.

C. Section 06112 – Framing and Sheathing: Wall substrate construction.

D. Section 07270 – Air Barriers: Moisture and air barrier over wood construction.

E. Section 07620 - Sheet Metal Flashing and Trim: Perimeter flashings.

F. Section 07900 - Joint Sealers: Perimeter sealant seal.

1.3 REFERENCES

A. ASTM C578 - Preformed Cellular Polystyrene Thermal Insulation.

B. EIMA (Exterior Insulation Manufacturers Association) - Guideline Specification For Exterior Insulation and Finish Systems, Class PB and Class PM.

1.4 SYSTEM DESCRIPTION

A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements in conjunction with thermal materials, weather tightness, and resistance to imposed wind and suction loads.

1.5 DESIGN REQUIREMENTS

A. Wind Load

1. For maximum allowable system deflection, normal to plane of the wall, of L/240.

2. Design for wind load in conformance with code requirements.

B. Moisture Control

1. Prevent the accumulation of water behind the EIF system, either by condensation or leakage through the wall construction, in the design and detailing of the wall assembly.

a. Provide flashing to direct water to the exterior where it is likely to penetrate components in the wall assembly, including, above windows and door heads, beneath window and door sills, at roof/wall intersections, abutments of lower walls, above projecting features, and at the base of the wall.

b. Air Leakage Prevention - provide continuity of air barrier system at foundation, roof, windows, doors and other penetrations through the system with connecting and compatible air barrier components to minimize condensation and leakage caused by air movement.

c. Vapor Diffusion and Condensation - perform a dew point analysis of the wall assembly to determine the potential for accumulation of moisture in the wall assembly as a result of water vapor diffusion and condensation. Advise Architect of concerns with potential condensation within the wall assembly.

C. Impact Resistance

1. Provide ultra-high impact resistance up to a minimum height of 6'-0" above finished grade at all areas accessible to pedestrian traffic and other areas exposed to abnormal stress or impact. Indicate the areas with impact resistance other than “Standard” on submittal drawings.

D. Joints

1. Provide minimum 3/4 inch wide expansion joints in the EIFS where they exist in the substrate or supporting construction, where the EIFS adjoins dissimilar materials, and at changes in building height. Coordinate the location of expansion joints with decorative patterns in the EIFS surface. Indicate joint locations on the submittal drawings.

2. Provide minimum 1/2 inch wide sealant joints at all penetrations through the EIFS (windows, door, etc.).

3. Provide compatible backer rod and sealant that has been evaluated in accordance with ASTM C1382, Test Method for Determining Tensile Adhesion Properties of Sealants When Used in Exterior Insulation and Finish Systems (EIFS) Joints, and that meets minimum 50% elongation after conditioning.

4. Provide joints in accordance with B.1.b so that the air barrier continuity is maintained across the joint and drain joints to the exterior.

E. Trim, Projecting Architectural Features and Reveals

1. All trim and projecting architectural features must have a minimum 1:1 slope along their top surface. All horizontal reveals must have a minimum 1:1 slope along their bottom surface.

1.6 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate wall joint patterns, joint details, and molding profiles.

C. Product Data: Provide data on system materials, product characteristics, performance criteria, and limitations.

D. Samples: Submit two inch size samples illustrating coating color and texture range for selection.

E. Manufacturer's Installation Instructions: Indicate preparation required, installation techniques, and jointing requirements

1.7 QUALIFICATIONS

A. Maintain quality under the provisions of Section 01400.

B. Manufacturer requirements

1. Member in good standing of the EIFS Industry Members Association (EIMA).

2. System manufacturer for a minimum of twenty-five (25) years.

3. Manufacturer ISO 9001:2000 Quality System Certified.

C. Installer requirements

1. Engaged in the application of EIFS for a minimum of three (3) years.

2. Knowledgeable in the proper use and handling of specified materials.

3. Employ skilled mechanics who are experienced and knowledgeable in EIFS application, and familiar with the requirements of the specified work.

4. Successful completion of minimum of three (3) projects of similar size and complexity to the specified project.

5. Provide the proper equipment, manpower and supervision on the job site to install the system in compliance with manufacturers published specifications and details and the project plans and specifications.

D. Insulation board manufacturer requirements

1. Recognized by system manufacturer as capable of producing insulation board to meet system requirements, and hold a valid licensing agreement with system manufacturer.

2. Listed by an approved agency.

3. Label insulation board with information required by system manufacturer, the approved listing agency and the applicable building code.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable code for system fire resistance ratings for finish system.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products under provisions of Section 01600.

B. Protect coatings (pail products) from freezing and temperatures in excess of 90 degrees F. Store away from direct sunlight.

C. Protect Portland cement based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental requirements under the provisions of Section 01400.

B. Do not install finish when ambient temperature is below 40 degrees F.

C. Maintain this temperature during and 24 hours after installation of finish.

1.11 COLOR SELECTIONS

A. At no additional cost, the Architect reserves the right to select colors from those selections equal to STO Industries, Inc., "STO Color System," consisting of 396 hues. (Minimal basic colors will not be acceptable.).

1. Other manufacturers shall provide a minimum of 300 color selections for Architect to choose from at no additional cost.

B. The Architect will be guided by the manufacturer's recommendations concerning certain colors not recommended for specific exposures.

1.12 WARRANTY

A. The complete installation of the system shall be jointly warranted by the installer and the manufacturer against defects in material and workmanship for a period of 12 years following installation and acceptance by the Owner. The warranty shall be submitted in writing through the Architect. to the Owner.

1.13 COORDINATION/SEQUENCING

A. Coordinate and sequence the work of this sections under the provisions of Section 01039.

B. Establish finish grade such that EIFS terminates above finished grade a minimum of 8 inches or as otherwise required by code.

C. Coordinate installation of foundation water proofing, flashings, windows, doors, and other penetrations to provide a continuous air barrier.

D. Provide protection of rough openings before installing windows, doors, and other penetrations through the wall and provide sill flashings.

E. Coordinate installation of windows and doors so air barrier components are connected to them to provide a continuous air barrier.

F. Install window and door head flashing immediately after windows and doors are installed.

G. Install diverter flashings wherever water can enter the wall assembly to direct water to the exterior.

H. Install copings and sealants immediately after installation of EIF system and when EIFS coatings are dry.

I. Attach penetrations through EIFS to structural support and provide water tight seal at penetrations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide EIFS System and accessories from a single source manufacturer or approved supplier.

B. Approved Manufacturers:

1. Sto Corp. - Air/Moisture Barrier and EIF System

2. Plastic Components, Inc. – Accessories

3. Substitutions permitted under the provisions of Section 01600.

2.2 MATERIALS

A. Air/Moisture Barrier: As specified in Section 07270.

B. Adhesive: Sto BTS-Plus - one component, polymer modified, cement based high build adhesive.

C. Insulation Board: Nominal 1.0 pound per cubic foot Expanded Polystyrene (EPS) Insulation Board in compliance with ASTM C578 Type I requirements, and EIMA Guideline Specification for Expanded Polystyrene (EPS) Insulation Board.

D. Base Coat: Sto BTS-Plus - one component polymer modified cement based high build base coat with less than 33 percent Portland Cement content by weight and capable of achieving minimum 1/16 inch thickness in one pass.

E. Reinforcing Mesh

1. Standard Mesh: Sto Mesh - nominal 4.5 ounces per square yard, symmetrical, interlaced open-weave glass fiber made with minimum 20 percent by weight alkaline resistant coating for compatibility with Sto materials.

2. Ultr-High Impact Mesh: Sto Armor Mat - nominal 15 ounces per square yard, ultrahigh impact, double strand, interwoven, open-weave glass fiber fabric with alkaline resistant coating for compatibility with Sto materials.

F. Finish Coat: Stolit - acrylic based textured wall coating with graded marble aggregate.

G. Job Mixed Ingredients

1. Water - clean and potable.

2. Portland Cement - Type 1

H. Accessories: Starter Track - rigid PVC (polyvinyl chloride) plastic track Part No.. STDE as furnished by Plastic Components, Inc. 9051 NW 97th Terrace, Miami, Florida 33178 (800 327-7077).

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01400.

B. Verify that substrate and adjacent materials are dry.

C. Verify substrate surface is flat, free of fins or irregularities.

D. Verify that air and moisture barrier is complete and ready to receive work of this section.

3.2 INSTALLATION

A. Install EIFS in compliance with manufacturer's printed instructions.

3.3 PROTECTION OF FINISHED WORK

A. Protect finished work under provisions of Section 01500.

B. Provide protection of installed materials from water infiltration into or behind them.

C. Provide protection of installed materials from dust, dirt, precipitation, freezing and continuous high humidity until they are fully dry.

D. Do not permit finish surface to become soiled or damaged.

END OF SECTION

SECTION 07260

VAPOR RETARDERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sheet materials for use in conjunction with blown-in insulation.

B. Sheet materials for use in conjunction with unfaced batt insulation.

1.2 RELATED SECTIONS

A. Division 1 - General Requirements.

B. Section 07213 – Batt Insulation

C. Section 07217 - Blown Insulation

1.3 REFERENCES

A. ASTM E96 - Test Methods for Water Vapor Transmission of Materials.

1.4 DEFINITION

A. Vapor Retarder: A material or assembly of materials that resists water vapor diffusion through it.

1.5 SYSTEM DESCRIPTION

A. Materials and installation methods to provide continuity of vapor retarder.

1. In conjunction with materials described in Section 07213.

2. To seal gaps between enclosure components and opening frames.

1.6 PERFORMANCE REQUIREMENTS

A. Maximum Vapor Permeability (Perm): 1ng/S/m/pa measured in accordance with ASTM E96 Method E.

1.7 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data indicating material characteristics, performance criteria, and limitations.

C. Manufacturer's Installation Instructions: Indicate preparation and installation requirements, techniques.

1.8 SEQUENCING

A. Sequence Work to permit installation of materials in conjunction with other retardant materials and seals.

B. Do not install vapor retarder until items penetrating it are in place.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

A. Sheet Retarder: Polyethylene film for above grade application, 6 mil thick.

2.2 ACCESSORIES

A. Adhesive: Compatible with sheet barrier and substrate, permanently non-curing.

B. Tape: Polyethylene self-adhering type, 2 inch wide, compatible with sheet material.

C. Attachments: Staples compatible with sheet material substrate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate under provisions of Section 01400.

B. Verify that substrate is acceptable and ready to receive work of this section.

3.2 PREPARATION

A. Prepare substrate under provisions of Section 01400.

B. Remove loose or foreign matter which impair adhesion.

3.3 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Vapor Retarder for Truss Framed Ceilings: Secure sheet barrier to truss faces with staples. Lap edges and ends to adjacent construction.

C. Seal all laps, tears or cuts in membrane with tape.

END OF SECTION

SECTION 07270

AIR AND MOISTURE BARRIER

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Materials and installation of air and moisture barrier over wall sheathing under masonry veneer and EIFS.

1.2 RELATED SECTIONS

A. Division 1 – General Requirements

B. Section 06112 – Framing and Sheathing: Wood framed wall substrate.

C. Section 07260 - Vapor Retarders: Vapor retarders.

D. Section 07900 - Joint Sealers: Sealant materials and installation techniques.

1.3 REFERENCES

A. American Society of Civil Engineers:

1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

B. ASTM International

1. ASTM C297 - Test Method for Tensile Strength of Flat Sandwich Constructions in Flatwise Plane.

2. ASTM C1177 - Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

3. ASTM C1396 - Standard Specification for Gypsum Board.

4. ASTM D522 - Test Methods for Mandrel Bend Test of Attached Organic Coatings.

5. ASTM D882 - Test Methods for Tensile Properties of Thin Plastic Sheeting.

6. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

7. ASTM D2247 - Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.

8. ASTM D3273 - Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

9. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

10. ASTM E96 - Test Methods for Water Vapor Transmission of Materials.

11. ASTM E119 - Methods for Fire Tests of Building Construction and Materials.

12. ASTM E283 - Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

13. ASTM E330 - Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

14. ASTM E331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

15. ASTM E1233 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.

16. ASTM E2178 - Test Method for Air Permeance of Building Materials.

17. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

C. Building Code Standards

1. SBCCI PST & ESI Evaluation Guide on Floor, Wall, and Roof Systems (Testing for Moisture Protection Barriers), Evaluation Guide 119.

2. NFPA 285, Method of Test for the Evaluation of Flammability Characteristics of Exterior, Nonload-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus

3. NFPA 268, Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source

4. ICBO Acceptance Criteria for Exterior Insulation and Finish Systems, AC 24

5. CCMC Technical Guide on Air Barriers

D. Gypsum Association

1. GA-600 Fire Resistance Design Manual

2. GA-253 Recommended Specifications for the Application of Gypsum Sheathing

3. GA-254 Fire-Resistant Gypsum Sheathing

E. American Plywood Association

1. E30 Residential and Commercial Construction Guide

F. Proprietary Specifications

1. AATCC (American Association of Textile Chemists and Colorists), Test Method127, Water Resistance: Hydrostatic Pressure Test

G. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)

1. 2005 ASHRAE Handbook--Fundamentals.

1.4 DESIGN REQUIREMENTS

A. Structural (Wind and Axial Loads):

1. Design for maximum allowable deflection normal to the plane of the wall: L/240

2. Design for wind load in conformance with code requirements.

B. Moisture Control:

1. Prevent the accumulation of water in the wall assembly and behind the exterior wall cladding:

2. Minimize condensation within the assembly.

3. Drain water directly to the exterior where it is likely to penetrate components in the wall assembly (windows and doors, for example).

4. Provide flashing to direct water to the exterior in accordance with code requirements, including, above window and door heads, beneath window and door sills, at roof/wall intersections, decks, intersections of lower walls with higher walls, and at the base of the wall.

C. Air Barrier Continuity: provide continuous air barrier system of compatible air barrier components.

D. Mechanical Ventilation: maintain pressurization and indoor humidity levels in accordance with recommendations of ASHRAE (see 2005 ASHRAE Handbook—Fundamentals).

1.5 PERFORMANCE REQUIREMENTS

TEST	METHOD	CRITERIA	RESULTS
1. Aging/Water Penetration Resistance	AATCC 127 (Water Column)	Resist 21.6 in (55 cm) water for 5 hours before and after aging	No water penetration before and after aging
2. Structural Loading/Water Penetration Testing	ASTM E 1233 / ASTM E 331	No water at exterior plane of sheathing. (exterior gypsum, Dens-Glass Gold, plywood, OSB) after 10 cycles @ 80% design load and 75 minutes water spray at 6.24 psf (299 Pa) differential	No water penetration
3. Cyclic Pressure/Water Penetration Testing	ASTM E 283/ ASTM E 331	No water penetration or evidence of elevated moisture levels in plywood sheathing after 10 cycles of conditioning at 299 Pa (6.24 psf) positive and negative pressure followed by 75 minutes water spray at 6.24 psf (299 Pa) pressure differential with water spray rate of 5 gal/ft^2·hr (3.4 L/m^2·min)	No water penetration, no elevated moisture levels
4. Water Resistance Testing	ASTM D 2247	Absence of deleterious effects after 14 day exposure	No deleterious effects after 14 day exposure
5. Resistance to Mold Growth	ASTM D 3273	No mold growth after 28 days	No mold growth after 28 day exposure
6. Freeze/Thaw Resistance	ICBO Method (AC 24)	No visible effects (cracking, checking, delamination, erosion) when viewed at 5x	No visible deleterious effects at 5x magnification
7. Water Vapor Permeance	ASTM E 96 Method B (Water Method)	Measure	Sto Gold Fill®: 7.10 perms 408 ng/(Pa·s·m^2) Sto Gold Coat®: 5.7 perms 327 ng/(Pa·s·m^2)
8. Air Leakage: Wall Assembly with Sto Gold Fill & Sto Gold Coat	ASTM E 283 (SBCCI PST & ESI Method)	<0.06 cfm/ft^2 @ 1.56 psf (0.00030 m^3/s·m^2 @ 75 Pa)	0.0044 cfm/ft^2 (0.000022 m^3/s·m^2)
9. Air Leakage: Sto Gold Fill	ASTM E 283 (CCMC Technical Guide Method)	<0.003 ft^3/min·ft^2 at 1.57 psf (<0.02 L/s·m^2 at 75 Pa)	0.0002 ft^3/min·ft^2 (0.0014 L/s·m^2)
10. Air Leakage: Sto Gold Coat®	ASTM E 2178	<0.004 cfm/ft^2 (<0.02 L/m^2·s) at 1.57 psf (75 Pa)	No air leakage when applied in 2 coats at average 14 DFT over CMU

11. Air Barrier Assembly Air Leakage Resistance	ASTM E 2357	Less than 0.2 L/s·m^2 air leakage after conditioning protocol	0.016 L/s·m^2
12. Structural Integrity	ASTM E 330	2 inches (51 mm) water pressure (positive & negative) for 1 hour.	No loss of structural integrity
13. Dry Tensile Strength	ASTM D 882	20 lbs/in (3503 N/m) minimum before and after aging	Sto Gold Fill®:159 pli (27.8 kN/m) before aging 213 pli (37.3 kN/m after aging
14. Nail Sealability	ASTM D 1970, par 7.9.1	No water penetration at galvanized roofing nail penetration under 5 inches (127 mm) head of water after 3 days at 40° F (4° C)	Pass over plywood and DensGlass Gold® sheathings
15. Flexibility	ASTM D 522	No cracking or delamination using 1/8" (3 mm) mandrel at 14°F (-10°C) before and after aging	No cracking or delamination before and after aging
16. Tensile Adhesion	ASTM C 297	>15 psi (103 kPa)	Gypsum (ASTM C 79): >30 psi (206 kPa) Gypsum (ASTM C 1177): > 30 psi (206 kPa) Exposure 1 OSB: > 50 psi (344 kPa) Exterior Plywood: > 90 psi (620 kPa)
17. Surface Burning	ASTM E 84	Flame Spread: <25 Smoke Developed: <450	Flame Spread: 5 Smoke Developed: 10 NFPA or ICC Class A building material
18. Fire Resistance	ASTM E 119	I hour	Meets criteria for 1 hour fire resistance rating when installed over I hour fire resistance rated sheathing
19. Radiant Heat Ignitibility	NFPA 268	No ignition at 20 minutes	Pass
20. Fire Propagation	NFPA 285	No increase in fire hazard	Pass

1.6 SUBMITTALS

A. Submit Under Provisions of Section 01300

B. Product Data: Submit data on material characteristics, performance criteria, and limitations.

C. Manufacturer's Installation Instructions: Submit preparation, installation requirements and techniques, product storage and handling criteria.

1.7 QUALITY ASSURANCE

A. Manufacturer requirements

1. Manufacturer of exterior wall air and moisture barrier materials for a minimum of 25 years in North America.

2. ISO 9001:2000 Certified Quality System and ISO 14001:2004 Certified Environmental Management System.

B. Contractor requirements

1. Knowledgeable in the proper use and handling of Sto materials.

2. Employ skilled mechanics who are experienced and knowledgeable in air and moisture barrier application, and familiar with the requirements of the specified work.

3. Provide the proper equipment, manpower and supervision on the job-site to install the system in compliance with Sto's published specifications and the project plans and specifications.

1.8 DELIVERY, STORAGE AND PROTECTION

A. Deliver materials in their original sealed containers bearing manufacturer's name and identification of product.

B. Protect coatings (pail products) from freezing temperatures and temperatures in excess of 90° F (32° C). Store away from direct sunlight.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient and surface temperatures above 40° F (4° C) during application and drying period, minimum 24 hours after application of air and moisture barrier.

B. Provide supplementary heat for installation in temperatures less than 40° F (4° C) or if surface temperature is likely to fall below 40° F (4° C).

C. Provide protection of surrounding areas and adjacent surfaces from application of materials.

1.10 SEQUENCING

A. Sequence Work to permit installation of materials in conjunction with related materials and seals.

1.11 COORDINATION

A. Coordinate the Work of this section with sections referencing this section.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Sto Corp.

B. Substitutions permitted under provisions of Section 01600.

2.2 AIR AND MOISTURE BARRIER

A. StoGuard®

2.3 COMPONENTS

A. Sto Gold Fill® – ready mixed flexible trowel or spray applied air barrier material.

B. Sto Gold Coat® - ready-mixed flexible spray or roller applied waterproof air barrier Material.

C. StoGuard® Tape – self adhering rubberized asphalt tape with polyester fabric facing.

D. StoGuard® Primer – rubber resin emulsion primer for use with StoGuard® Tape to enhance adhesion and allow installation down to 35º F (1.7ºC).

E. StoGuard® Mesh - nominal 4.2 oz/sq. yd. (142 g/m^2), self-adhesive, flexible, symmetrical, interlaced glass fiber reinforcing mesh, with alkaline resistant coating for compatibility with Sto materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Inspect sheathing application for compliance with applicable requirement:

1. Exterior gypsum sheathing — GA-253.

2. Exterior Grade and Exposure I wood based sheathing — APA E30.

3. Glass mat faced gypsum sheathing in compliance with ASTM C 1177 — Consult manufacturer's published recommendations.

4. Cementitious sheathing — Consult manufacturer's published recommendations.

5. Report deviations from the requirements of project specifications or other conditions that might adversely affect the waterproof air barrier installation. Do not start work until deviations are corrected.

3.2 PREPARATION

A. Remove surface contaminants and replace damaged sheathing.

B. Spot surface defects in sheathing with joint treatment.

C. Prime surfaces to receive StoGuard™ Tape.

3.3 MIXING

A. Mix materials with a clean, rust-free electric drill and paddle.

B. Do not dilute materials with water or add other ingredients

3.4 INSTALLATION

A. Install waterproof air barrier in compliance with manufacturer's written instructions.

3.5 SCHEDULE

A. Rough opening protection:

1. Sto Gold Fill® with StoGuard® Mesh.

B. Sheathing joints, corners:

1. Sto Gold Fill® with StoGuard® Mesh

C. Waterproof top coat over rough opening protection, joints, corners, crack treatment:

1. Sto Gold Coat®

END OF SECTION

SECTION 07311

ASPHALT SHINGLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Granular surfaced asphalt shingle roofing.

B. Ice dam protection, moisture shedding underlayment, eave, and valley protection.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 06112 - Framing and Sheathing: Roof sheathing.

C. Section 07620 - Sheet Metal Flashing and Trim: Associated flashings and accessories

1.3 REFERENCES

A. ASTM A361/A361M - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process for Roofing and Siding.

B. ASTM B209/B209M - Aluminum and Aluminum-Alloy Sheet and Plate.

C. ASTM D3452 - Asphalt Shingles made from Glass Felt and Surfaced with Mineral Granules.

D. ASTM D226 - Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

E. ASTM D3018 - Standard Classification for Class A Asphalt Shingles Surfaced with Mineral Granules.

F. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.

G. NRCA - Steep Roofing Manual.

H. ASTM D3161 - Standard Test Method for Wind Resistance of Asphalt Shingles.

1.4 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate specially configured metal flashings, jointing methods and locations, fastening methods and locations, and installation details.

C. Product Data: Provide data indicating material characteristics, performance criteria, and limitations.

D. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern; for color selection.

1.5 SUBMITTALS AT CLOSEOUT

A. Submit manufacturer's standard shingle product warranty.

1.6 QUALITY ASSURANCE

A. Maintain quality under provisions of Section 01400.

B. Perform Work in accordance with NRCA Steep Roofing Manual.

1.7 REGULATORY REQUIREMENTS

A. Conform to ASTM D3018 Class A rating for shingle types specified.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions under provisions of Section 01600.

B. Do not install eave edge protection and shingles when ambient air, or wind chill temperatures are below 45 degrees F.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Asphalt Shingles:

1. Certainteed Corporation; Landmark Plus Shingle

B. Similar products meeting the specified requirements from the following other manufacturers are acceptable:

1. GAF

2. IKO

3. Owens Corning

2.2 ASPHALT SHINGLES

A. Asphalt Shingles: ASTM D3462, E108 Class A fire resistance rating, fiberglass mat base, minimum 250 #/square, color as selected by Architect.

B. Shingle Accessories: Matching starter strips and ridge cap shingles as recommended by manufacturer.

2.3 SHEET MATERIALS

A. Eave (Ice Dam) Valley Protection: Sheet barrier of rubberized asphalt bonded to sheet polyethylene, 60 mil total thickness, with stripable treated release paper; "Winterguard" as manufactured by Certainteed or Grace Ice and Water Shield as manufactured by W.R. Grace and Company.

B. Underlayment: ASTM D226, No. 15 unperforated asphalt saturated felts as recommended for use in waterproofing and in construction of built-up roofs.

2.4 ACCESSORIES

A. Nails: Standard round wire shingle type hot dipped zinc coated steel barbed shank 3/8" head, sharp pointed conventional type, of sufficient length to penetrate through roof sheathing, with a 3/8 inch exposure so that barbed shanks engage in wood.

B. Ridge Vents: Plastic, formed with vent openings that do not permit direct water or weather entry; flanged to receive shingles; “Ridge Master Plus” as manufactured by Mid-America Building Products, Tapco International, Plymouth, Michigan.

2.5 FLASHING MATERIALS

A. Sheet Flashings as specified in Section 07620 - Sheet Metal Flashings and Trim.

B. Bituminous Paint: Acid and alkali resistant type; black color.

C. Aluminum Drip Edge as specified in Section 07620 - Sheet Metal Flashing and Trim.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions under provisions of Section 01400.

B. Verify that roof penetrations and plumbing stacks are in place and flashed form a watertight seal.

C. Verify roof openings are correctly framed.

D. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.2 PREPARATION

A. Prepare substrate under provisions of Section 01400.

B. Fill knot holes and surface cracks with latex filler at areas of bonded eave protection.

C. Broom clean deck surfaces under eave protection and underlayment.

3.3 INSTALLATION - EAVE (ICE DAM) PROTECTION

A. Place eave edge and gable edge metal drip edge tight with fascia boards. Weather lap joints 2 inches. Secure flange with nails spaced 24 inches o.c.

B. Apply rubberized asphalt/polyethylene sheet eave protection in accordance with manufacturer's instructions.

C. Extend eave protection membrane minimum 8 ft up-slope from roof edge.

3.4 INSTALLATION - PROTECTIVE UNDERLAYMENT

A. Place one ply of underlayment over area not protected by eave protection, with ends and edges weather lapped minimum 4 inches. Stagger end laps of each consecutive layer. Nail in place.

B. Install protective underlayment perpendicular to slope of roof and weather lap minimum 6 inches over eave protection.

3.5 INSTALLATION - VALLEY PROTECTION

A. Place rubberized asphalt/polyethylene sheet as valley protection.

1. Place 3' wide sheet full length of valley centered on valley.

2. Lap additional 3' wide sheet 6" over valley sheet each side full length of valley to provide 8 feet of membrane flashing.

3.6 INSTALLATION - METAL FLASHING AND ACCESSORIES

A. Weather lap joints minimum 2 inches and seal weather tight.

B. Secure in place with nails. Conceal fastenings.

C. Flash and seal work weather tight, projecting through or mounted on roofing with plastic cement.

3.7 INSTALLATION - ASPHALT SHINGLES

A. Install shingles in accordance with manufacturer's instructions.

B. Place shingles in straight coursing pattern with recommended weather exposure to produce double thickness over full roof area. Provide double course of shingles at eaves.

C. Project first course of shingles 1/4 inch beyond drip edge.

D. Extend shingles 1/4 inch beyond lip of gable drip edge.

E. Extend shingles on minor slope across valley a minimum of 12" inches and fasten. Extend shingles on major slope across valley, and cut back to 2" above valley center.

F. Cap hips and ridges with individual shingles, maintaining recommended weather exposure. Place to avoid exposed nails.

G. Coordinate installation of roof mounted components or work projecting through roof with weather tight placement of counter flashings.

H. Complete installation to provide weather tight service.

3.8 PROTECTION OF FINISHED WORK

A. Protect installed work under provisions of Section 01500.

B. Do not permit traffic over finished roof surface.

END OF SECTION

SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Miscellaneous flashing not specified elsewhere.

B. Preformed drip edge, fascia, soffit and trims.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 06112 – Framing and Sheathing

C. Section 07270 – Air and Moisture Barriers

D. Section 07900 - Joint Sealers.

E. Section 09900 - Painting: Prime and finish painting.

1.3 REFERENCES

A. AISI (American Iron and Steel Institute) - Stainless Steel - Uses in Architecture.

B. American Society for Testing and Materials; Testing and material standards.

C. NRCA (National Roofing Contractors Association) - Roofing Manual.

D. SMACNA - Architectural Sheet Metal Manual.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Submit two (2) samples illustrating metal finish color.

1.5 QUALITY ASSURANCE

A. Maintain quality under provisions of Section 01400.

B. Perform work in accordance with SMACNA standard details and requirements.

1.6 QUALIFICATIONS

A. Maintain quality under provisions of Section 01400.

B. Fabricator and Installer: Company specializing in sheet metal flashing work with three (3) years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Transport, deliver, store, protect and handle products to site under provisions of Section 01600.

B. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials which may cause discoloration or staining.

1.8 COORDINATION

A. Coordinate work under provisions of Section 01039.

B. Coordinate with the work of other sections.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

A. Aluminum Sheet for flashings, drip edge, soffits and associated trim, fascias: ASTM B209M 3003 alloy, H14 temper; .032 inch thick; prefinished anodized aluminum. Color to be selected by Architect.

2.2 ACCESSORIES

A. Fasteners: Aluminum. Same material and finish as flashing metal for concealed anchoring.

B. Underlayment: ASTM D226, No. 15 asphalt saturated roofing felt. FS L-P-512, 6 mil polyethylene.

C. Primer: Zinc chromate, galvanized iron, iron oxide linseed oil depending on material.

D. Protective Backing Paint: Bituminous.

E. Sealant: As specified in Section 07900 and/or as recommended by component manufacturer.

F. Bedding Compound: Rubber-asphalt.

G. Plastic Cement: ASTM D4586, Type I.

2.3 COMPONENTS

A. Drip edge, flashings, associated channels: SMACNA style profile.

B. Soffit: Triple 12” wide ribbed panel; full perforated.

C. Fascia: Preformed with stiffening rib, 1 inch bottom return with hemmed edge, height as required.

2.4 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths and in single length sheets.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

2.5 FINISH

A. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site conditions under provisions of Section 1400.

B. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, reglets in place, and nailing strips located.

C. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

A. Prepare substrate under provisions of Section 1400.

B. Install starter and edge strips, and cleats before starting installation.

3.3 INSTALLATION

A. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparing substrate surfaces.

B. Sealant and joint backing.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 03300 – Cast-in-Place Concrete: Joints in concrete requiring sealers.

C. Section 03451 – Architectural Precast Concrete: Joints in architectural precast concrete requiring sealers.

D. Section 04300 – Unit Masonry Systems: Joints in unit masonry systems requiring sealers.

E. Section 06200 – Finish Carpentry: Joints in finish carpentry requiring sealers.

F. Section 06625 – Solid Plastic Fabrications: Joints in plastic fabrications requiring sealers.

G. Section 07241 Exterior Insulation and Finish System: Joints in EIFS requiring sealers.

H. Section 07620 – Sheet Metal Flashing and Trim: Joints in sheet metal flashing and trim requiring sealers.

I. Section 08112 – Standard Steel Frames: Joints in connection with standard steel frames requiring sealers.

J. Section 08610 - Wood Windows: Joints in connection with wood windows requiring sealers.

K. Section 08700 - FRP Flush Doors and Aluminum Frames: Joints in connection with FRP doors and aluminum frames requiring sealers.

L. Section 09306 – Floor Tile: Joints in floor tile requiring sealers.

M. Section 09307 – Wall Tile: Joint sin wall tile requiring sealers.

N. Section 12300 – Manufactured Casework: Joints in connection with manufactured casework requiring sealers.

O. DIVISION 15 – Mechanical: Sealers required in connection with Mechanical work.

P. DIVISION 16 – Electrical: Sealers required in connection with Electrical work.

1.3 REFERENCES

A. American Society of Testing and Materials - Testing and material standards.

B. SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

C. Samples: Submit two (2) samples, 1/4" x 4" inch in size illustrating sealant colors for selection.

D. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

A. Maintain quality under provisions of Section 01400.

B. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

1.6 QUALIFICATIONS

A. Maintain quality under provisions of Section 01400.

B. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

C. Applicator: Company specializing in performing the work of this section with minimum three years experience and as approved by manufacturer.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions under provisions of Section 01400.

B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.8 COORDINATION

A. Coordinate work under provisions of 01039.

B. Coordinate the work with all sections referencing this section.

1.9 WARRANTY

A. Submit under provisions of Section 01700.

B. Provide five year extended warranty.

C. Warranty: Include coverage for installed sealants and accessories which fail to achieve air tight seal, water tight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.1 SEALANTS

A. General

1. Where the term "Acceptable Standard" is used within this Section, it refers to the manufacturer and product listed, which is specified as the type and quality required for this Project.

2. Products of other manufacturers will be considered, providing their products equal or exceed the quality specified, and they can provide products of the type and quality required.

3. Single source responsibility for joint sealer materials: Obtain joint sealer materials from a single manufacturer for each different product required.

4. Compatibility: Provide joint sealers, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and final experience.

B. Acrylic Emulsion Latex Caulk: ASTM C834, Single component, gun grade, non-staining, non-bleeding, non-sagging; mildew resistant formulated to be paintable and recommended for exposed non-structural applications on interior locations involving joint movement of less than 12 1/2 percent for joints 1/4 inch to 3/4 inch x 1/2 inch in size.

1. Acceptable Standards

a. "Acrylic Latex 834", Tremco, Inc

b. "Chem-Calk 600", Bostik Construction Products

c. "Sonolac", Sonneborn-Chemrex Inc.

d. "AC-20 + Silicone", Pecora Corporation

2. Caulking compound shall be used for interior non-moving joints, joints between dissimilar materials being painted, interior corners at CMU walls subject to cracking, and at specific locations indicated in the construction drawings.

C. Polyurethane Sealant (Type M): ASTM C920, Grade P, Class 25, Use; Interior floor joint applications; single component, chemical curing, non-staining, non-bleeding, capable of continuous water immersion, non-sagging self-leveling type 1, color as selected by Architect; manufactured by Pecora Corp, NR200 Urexpan or Eqoisia Lett.

1. Elongation Capability 25% percent

2. Service Temperature Range 180 degrees F

3. Shore A Hardness Range 20 to 35

D. Silicone Sealant: ASTM C920, Grade NS, Class 25, Where thermal and/or dynamic movement is anticipated use single component, solvent curing, non-sagging, non-staining, fungus resistant, non-bleeding; color as selected by Architect.

1. Acceptable Standards

   a. "Chem-Calk 1000", Bostik Construction Products

   b. "Omni Seal", Sonneborne-Chemrex, Inc.

   c. "864 Silicone", Pecora Corporation

   d. "Dow Corning 795", Dow Corning Corp.

2. One component elastomeric sealants shall be used at external and internal joints where thermal or dynamic movement is anticipated including, but not limited to, the following locations:

   a. Metal to metal joints.

   b. Sheet metal flashings, copings, preformed metal caps, fascias, extenders, trim and panels.

   c. Glass to glass joints.

   d. Glass to metal joints.

E. Silicone Sealant (Type S): ASTM C920, single component, mildew resistant, fungus resistant, chemical curing, non-sagging, non-staining, non-bleeding; formulated for use in conjunction with plumbing fixtures, ceramic tile and other conditions where high humidity and temperature extremes are anticipated; color as selected by Architect; manufactured by Dow Corning Company, Type 795 or equal.

1. Acceptable Standards

   a. "Dow Corning 786", Dow Corning Corp.

   b. "Rhodorsil 6B White", Rhone-Poulenc Inc.

   c. "SCS 1702 Sanitary" General Electric

2. One part mildew resistant sealant shall be used around counter tops and for sealing backsplashes and for other wet interior locations.

F. Multi-Part Epoxidized Elastomeric Polyutethane Terpolymer Sealant: ASTM C920 type M, Grade NS, Class 25. For watertight seals in building joints; color to be selected by the Architect.

1. Acceptable Standards

   a. "Dymeric", Tremco Inc.

   b. "Chem-Calk 500", Bostik Construction Products

   c. "Sonolastic NP 2", Sonneborne-Chemrex Inc.

   d. "Dynatrol 2", Pecora Corporation.

2. Multi part elastomeric urethane sealants shall be used at exterior and interior joints where weatherproofing or waterproofing is required and at exterior joints between dissimilar materials including, but not limited to, the following locations:

a. Expansion and control joints.

b. Exterior side of hollow metal frames to adjacent materials.

c. Louvers to adjacent construction.

d. Vertical and horizontal control joints and expansion joints in the building - interior and exterior sides.

e. Sealant in pipe sleeves where materials must perforate the floor slab.

f. perimeter of floor slabs or concrete curbs which abut vertical surfaces.

g. Exterior joints between dissimilar materials where the joining of the two surfaces leaves a gap between the meeting materials or components as may be dictated by the various methods of construction to make watertight.

h. Exterior locations which are noted "caulked" or sealant" and not specifically listed herein or included in the Work of other Sections of the Specifications.

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: ASTM D1056; round, closed cell neoprene sponge rubber tube; oversized 30 to 50% percent larger than joint width; "Everlastic" as manufactured by Williams Products Inc.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site conditions under provisions of Section 01400.

B. Verify that substrate surfaces and joint openings are ready to receive work.

C. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

A. Prepare substrate under provisions of Section 01400.

B. Remove loose materials and foreign matter which might impair adhesion of sealant.

C. Clean and prime joints in accordance with manufacturer's instructions.

D. Perform preparation in accordance with manufacturer's instructions.

E. Protect elements surrounding the work of this section from damage or disfiguration.

3.3 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions.

B. Measure joint dimensions and size materials to achieve required 2:1 width/depth ratios.

C. Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.

D. Install bond breaker where joint backing is not used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Tool joints concave or as detailed.

3.4 CLEANING

A. Clean work under provisions of Section 01700.

B. Clean adjacent soiled surfaces.

3.5 PROTECTION OF FINISHED WORK

A. Protect finished installation under provisions of Section 01500.

B. Protect sealants until cured.

END OF SECTION

SECTION 08111

STANDARD STEEL DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-rated steel doors.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 08112 - Standard Steel Frames.

C. Section 08710 - Door Hardware.

D. Section 08800 - Glazing: Glass for doors.

E. Section 09900 - Painting: Field painting of doors.

1.3 REFERENCES

A. ANSI A117.1 – Accessible and Usable Buildings and Facilities: Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.

B. ASTM A525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

C. ASTM C236 - Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot-Box.

D. DHI (Door Hardware Institute) - The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.

E. SDI-100 - Standard Steel Doors and Frames.

1.4 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01300.

B. Product Data: Indicate door configurations, location of cut-outs for hardware reinforcement.

C. Shop Drawings: Indicate door elevations, internal reinforcement, closure method, and cut-outs for glazing and finishes.

1.5 SUBMITTALS FOR INFORMATION

A. Submit under provisions of Section 01300.

B. Manufacturer's Installation Instructions: Indicate special installation instructions.

C. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

A. Maintain quality work under provisions of Section 01400.

B. Conform to requirements of SDI-100 and ANSI A117.1.

C. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

A. Americans with Disabilities Act (ADA) and Michigan Building Code Barrier Free Requirements

1. Doors shall conform to ADA requirements and ANSI A117.1 requirements. ADA and ANSI A117.1 requirements shall supersede technical specifications of this section. Conform to ADA Guidelines for Buildings and Facilities, Section 4.13 Doors, and other applicable sections. Conform to ANSI A117.1 Accessible and Usable Buildings and Facilities, Section 404 Doors and Doorways, and other applicable sections.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Transport, handle, store, and protect products under provisions of Section 01600.

B. Protect doors with resilient packaging sealed with heat shrunk plastic.

C. Break seal on site to permit ventilation.

1.9 PROJECT CONDITIONS

A. Coordinate work under provisions of Section 01039.

B. Coordinate frame installation with size, location, and installation of service utilities.

C. Coordinate the work with door opening construction, door frame, and door hardware installation.

D. Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

PART 2 PRODUCTS

2.1 DOOR MANUFACTURERS

A. Pioneer Industries, Carlstadt, New Jersey

B. Republic Builders Products Corporation, McKenzie, Tennessee

C. Steelcraft by American Standard, Cincinatti, Ohio

D. Amweld Building Products Division, Niles, Ohio

E. Fenestra, Erie, Pennsylvania

F. The Ceco Corp., Chicago, Illinois

G. Curries of Kidde, Mason City, Iowa

H. The Kawanee Corp., Kawanee, Illinois

I. Or equal

2.2 DOORS

A. Interior Doors (Non-rated): SDI-100 Grade II Model 1, 18 ga. full flush, hollow steel.

B. Interior Doors (Acoustic): SDI-100 Grade II Model 1, 18 ga. full flush, hollow steel.

2.3 DOOR CONSTRUCTION

A. Face: Steel sheet in accordance with SDI-100.

B. End Closure: Channel, 16 ga. min. thick, inverted.

C. Core: Cardboard honeycomb - non-insulated.

2.4 ACCESSORIES

A. Glass: In accordance with Section 08800.

B. Removable Stops: Rolled steel, channel shape, butted corners; prepared for countersink style tamper proof screws.

C. Primer for Steel Doors: Rust inhibitive enamel bake or air-dry in accordance with ANSI A224.1 suitable as a base for specified paint finish.

2.5 FABRICATION

A. Astragals for Double Doors: Steel 14 ga., Z shaped, specifically for double doors. Specified in Section 08710 located on inactive leaf of all double doors and all double leaf fire rated doors.

B. Fabricate doors with hardware reinforcement welded in place.

C. Fabricate all lights in doors of flush type. Wrap around style glazing hardware will not be accepted except at exterior doors receiving 1 inch insulating glass.

2.6 FINISH

A. Steel Sheet: Interior - Standard sheet, Exterior - galvanized to ASTM A525 60.

B. Finish in the Field

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions under provisions of Section 01400.

B. Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

A. Install doors in accordance with SDI-100 and DHI.

B. Coordinate installation of glass and glazing.

C. Coordinate installation of doors with installation of frames specified in Section 08112 and hardware specified in Section 08710.

D. Touch-up factory finished doors.

3.3 ERECTION TOLERANCES

A. Maintain tolerances under provisions of Section 01400.

B. Maximum Diagonal Distortion: 1/16" inch measured with straight edge, corner to corner.

3.4 ADJUSTING

A. Adjust installed work under provisions of Section 01700.

B. Adjust door for smooth and balanced door movement.

3.5 SCHEDULE

A. Refer to Door and Frame Schedule in the construction drawings.

END OF SECTION

SECTION 08112

STANDARD STEEL FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel frames.

B. Interior glazed lite frames.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 07900 - Joint Sealers

C. Section 08111 – Standard Steel Doors

D. Section 08211 - Flush Wood Doors

E. Section 08710 - Door Hardware: Hardware and weatherstripping.

F. Section 08800 – Glazing: Glazing in standard steel frames.

G. Section 09900 - Painting: Field painting of frames.

1.3 REFERENCES

A. ANSI A117.1 – Accessible and Usable Buildings and Facilities: Specifications for making buildings and facilities accessible to and usable by physically handicapped people.

B. American Society of Testing and Materials - Testing and material standards.

C. DHI - Door Hardware Institute: The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.

D. NFPA 80 - Fire Doors and Windows.

E. NFPA 252 - Fire Tests for Door Assemblies.

F. SDI-100 - Standard Steel Doors and Frames.

G. UL 10C - Fire Tests of Door Assemblies.

1.4 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01300.

B. Product Data: Bituminous coating (back paint of frames, specification sheet).

C. Shop Drawings: Indicate frame elevations, configuration, reinforcement, anchor types and spacings, location of cut-outs for hardware, and finish.

1.5 QUALITY ASSURANCE

A. Maintain quality under provisions of Section 01400.

B. Conform to requirements of SDI-100 and ANSI A117.1.

C. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.6 REGULATORY REQUIREMENTS

A. Fire Rated Frame Construction: Tested in conformance with NFPA 252 or UL 10C meeting positive pressure requirements.

B. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as indicated.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Transport, handle, store, and protect products under provisions of Section 01600.

B. Accept frames on site in manufacturer's packaging. Inspect for damage.

1.8 PROJECT CONDITIONS

A. Coordinate work under provisions of Section 01039.

B. Coordinate the work with frame opening construction, door, and hardware installation.

C. Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

PART 2 PRODUCTS

2.1 FRAME MANUFACTURERS

A. Pioneer Industries; Carlstadt, New Jersey.

B. Steel Craft by American Standard; Cincinnati, Ohio

C. Republic Builders Products Corporation; McKenzie, Tennessee

D. CECO Corp.; Chicago, Illinois

E. Amweld Building Products Division; Niles, Ohio

F. Fenestra; Erie, Pennsylvania

G. Curries of Kidde; Mason City, Iowa

H. The Kawanee Corp.; Kawanee, Illinois

I. Or equal

2.2 FRAMES

A. Frames: To suit SDI-100 Grade and Model of door specified in Section 08111.

B. All interior frames shall be fabricated from 16 ga. sheet metal.

2.3 ACCESSORIES

A. Bituminous Coating: For back painting of each frame - all surfaces.

B. Primer for steel frames: rust inhibitive enamel, bake or air dry in accordance with ANSI 224.1, suitable as a base for specified finish.

C. Silencers: Specified in Section 08710. Rubber fitted into drilled hole.

2.4 FABRICATION

A. Fabricate frames as welded unit.

B. Mullions for Double Doors: Provided in Section 08710.

C. Transom Bars for Glazed Lights: Fixed type, of same profiles as jamb and head.

D. Fabricate frames with hardware reinforcement plates welded in place. Provide mortar guard boxes.

E. Reinforce frames wider than 48" inches with roll formed steel channels fitted tightly into frame head, flush with top.

F. Prepare frames for silencers. Provide three (3) single silencers for single doors and mullions of double doors on strike side.

G. Attach fire rated label to each fire rated unit.

H. Fabricate frames to match frame profiles depicted in plans.

2.5 FINISH

A. Primer: Baked in accordance with ANSI A224.1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions under provisions of Section 01400.

B. Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

A. Install frames in accordance with SDI-100 and DHI.

B. Coordinate with wall construction. Provide minimum three (3) anchors per jamb, at hinge and strike heights.

C. Coordinate installation of glass and glazing.

D. Coordinate installation of frames with installation of hardware specified in Section 08710 and doors in Section 08211.

E. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

F. Do not place any foreign filler such as wood or foam into frame grouted areas for hardware installations without approval from the Architect in writing.

G. Sealant perimeter of hollow metal frame to adjacent construction with sealant specified in Section 07900.

3.3 ERECTION TOLERANCES

A. Maintain tolerances under provisions of Section 01400.

B. Maximum Diagonal Distortion: 1/16" inch measured with straight edges, crossed corner to corner.

END OF SECTION

SECTION 08211

FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flush wood doors and flush glazed configuration; fire rated and non-rated.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 08112 - Standard Steel Frames

C. Section 08710 - Door Hardware

D. Section 08800 – Glazing: Glazing in doors.

1.3 REFERENCES

A. ANSI A135.4 - Basic Hardboard.

B. American Society of Testing and Materials - Testing and material standards.

C. AWI - Quality Standards of the Architectural Woodwork Institute.

D. HPMA HP - Hardwood and Decorative Plywood.

E. NFPA 80 - Fire Doors and Windows.

F. NFPA 252 - Standard Method of Fire Tests for Door Assemblies.

G. UL 10B - Fire Tests of Door Assemblies.

H. Warnock Hersey - Certification Listings for Fire Doors.

1.4 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01300.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing, and louvers.

D. Samples: Submit two (2) samples of door veneer, 10" x 10" inch in size illustrating wood grain, stain color, and sheen. (pattern and color).

1.5 QUALITY ASSURANCE

A. Maintain quality under provisions of Section 01400.

B. Perform work in accordance with AWI Quality Standard Section 1300.

C. Finish doors in accordance with AWI Quality Standard Section 1500.

D. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.6 REGULATORY REQUIREMENTS

A. Fire Door Construction: Tested in accordance with NFPA 252 or UL 10C meeting positive pressure requirements.

B. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as indicated.

A. Americans with Disabilities Act (ADA) and Michigan Building Code Barrier Free Requirements

1. Doors shall conform to ADA requirements and ANSI A117.1 requirements. ADA and ANSI A117.1 requirements shall supersede technical specifications of this section. Conform to ADA Guidelines for Buildings and Facilities, Section 4.13 Doors, and other applicable sections. Conform to ANSI A117.1 Accessible and Usable Buildings and Facilities, Section 404 Doors and Doorways, and other applicable sections.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Transport, handle, store, and protect products under provisions of Section 01600.

B. Package, deliver and store doors in accordance with AWI Section 1300.

1.8 PROJECT CONDITIONS

A. Coordinate work under provisions of Section 01039.

B. Coordinate the work with door opening construction, door frame and door hardware installation.

1.9 WARRANTY

A. Submit warranty under provisions of Section 01700.

B. Warranty term: Lifetime of door.

C. Include coverage for delamination of veneer, warping, cupping, twisting, beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS - (Solid Core Door w/Wood Veneer Faces)

A. Algoma Hardwoods, Inc.

B. Marshfield

C. Graham Manufacturing Corporation

D. VT Industries

E. Oskosh Architectural Door Company

2.2 DOOR TYPES

A. Flush Interior Doors: 1-3/4" inches thick; solid core construction, as indicated.

2.3 DOOR CONSTRUCTION

A. Core (Solid, Non-Rated): AWI Section 1300, Particleboard Type PC-5 or PC-7, Type PC.

B. Core (Solid, Fire-Rated): AWI Section 1300, Type as required to achieve required ratings.

2.4 FLUSH DOOR FACING

A. Veneer Facing (Flush Interior Doors): AWI Premium quality species wood, plane sliced red oak with book matched grain, for transparent finish.

B. Facing (Interior): ANSI A135.4, Class 2 - Standard, Type S2S hardboard, 1/8" inch thick.

2.5 ADHESIVE

A. Facing Adhesive: Type I - waterproof, or Type II - water resistant. Use of formaldehyde is not acceptable.

2.6 ACCESSORIES

A. Glazing Stops:

1. Non-Fire Rated Doors: Flush wood, same species as door face.

2. Fire Rated doors: Metal wrap around type, prepared for countersunk tamperproof screws.

2.7 FABRICATION

A. Fabricate non-rated doors in accordance with AWI Quality Standards requirements.

B. Fabricate fire rated doors in accordance with AWI Quality Standards and to UL requirements. Attach fire rating label to door.

C. Astragals for Fire Rated Double Doors: Steel, Z shaped, overlapping and recessed at face edge, specifically for double doors.

D. Provide closer and lock blocks at lock edge and top of door closer location for hardware reinforcement. The use of thru-bolts to attach hardware is not acceptable.

E. Vertical Exposed Edge of Stiles: Of same species as veneer facing. Hardwood finish.

F. Fit door edge trim to edge of stiles after applying veneer facing.

G. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Provide solid blocking.

H. Factory fit doors for frame opening dimensions identified on shop drawings.

I. Provide edge clearances in accordance with AWI 1600.

2.8 FINISH

A. Factory finish doors in accordance with Architect/Engineer provided sample.

B. Seal door top edge with sealer to match door facing.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions under provisions of Section 01400.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

A. Install fire rated and non-rated doors in accordance with AWI Quality Standard and NFPA 80.

B. Trim non-rated door width by cutting equally on both jamb edges.

C. Trim door height by cutting bottom edges to a maximum of 3/4 inch. Trim fire door height at bottom edge only, in accordance with fire rating requirements.

D. Machine cut for hardware.

E. Coordinate installation of doors with installation of frames specified in Section 08112 and hardware specified in Section 08710.

F. Coordinate installation of glass and glazing.

G. Install door louvers plumb and level.

3.3 INSTALLATION TOLERANCES

A. Maintain tolerance under provisions of Section 01400.

B. Conform to AWI requirements for fit and clearance tolerances.

C. Conform to AWI Section 1300 requirements for maximum diagonal distortion.

D. Maximum Width Distortion (Cup): 1/8" inch measured with straight edge or taut string, edge to edge, over an imaginary 36 x 84 inches surface area.

3.4 ADJUSTING

A. Adust installed work under provisions of Section 01700.

B. Adjust door for smooth and balanced door movement.

C. Adjust closer for full closure.

END OF SECTION

SECTION 08305

ACCESS DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Attic access doors

1.2 RELATED SECTIONS

A. Division 1 - General Requirements.

B. Section 09260 - Gypsum Board Systems: Openings in gypsum board substrate.

C. Section 09900 - Painting: Field finish of exposed to view access doors.

1.3 REFERENCES

A. UL Fire Resistance Directory.

B. Warnock Hersey - Certification Listings.

1.4 DESIGN REQUIREMENTS

A. Access Panels shall be “C” label 45 minute fire-rated.

1.5 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01300.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of all access door units.

1.6 SUBMITTALS FOR INFORMATION

A. Submit under provisions of Section 01300.

B. Manufacturer's Installation Instructions: Indicate installation requirements, and rough-in dimensions.

1.7 SUBMITTALS AT PROJECT CLOSEOUT

A. Submit under provisions of Section 01700.

B. Record of actual locations of all access units.

1.8 QUALITY ASSURANCE

A. Maintain quality under provisions of Section 01400.

B. Perform Work in accordance with UL File No. R10306.

1.9 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated access doors.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of fire rated doors.

1.10 PROJECT CONDITIONS

A. Coordinate the work with other work requiring access doors under provisions of Section 01039.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Accudor Products Inc., Fairfield, New Jersey

B. Or equal

2.2 ACCESS UNITS

A. Ceiling Mounted Fire Rated Insulated Attic Access Door and Frame Unit equal to Acudor Model FW-5050 (22x30).

2.3 FINISHES

A. Steel: 5 stage iron phosphate preparation with prime coat of grey baked enamel.

B. Finish exposed to view access doors in field under Section 09900.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify conditions under provisions of Section 01039.

B. Verify that rough openings for door and frame are correctly sized and located

3.2 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in opening. Secure rigidly in place.

C. Position unit to provide convenient access to concealed work requiring access.

END OF SECTION

SECTION 08610

WOOD WINDOWS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Factory assembled clad wood windows, glass and glazing, operable hardware, weatherstripping, and insect screens.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 07900 - Joint Sealers: Perimeter sealant and back-up materials.

C. Section 09900 - Painting: Site finishing wood surfaces.

1.3 REFERENCES

A. ASCE 788 - Calculation of Wind Loads.

B. ASTM C1036 - Flat Glass.

C. ASTM E283 - Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.

D. ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

E. NWWDA IS-2 - Wood Windows.

F. NWWDA IS-4 - Water Repellant Preservative Non-Pressure Treatment for Millwork.

G. ASTM E 547 - Water penetration of exterior windows, curtain walls and doors by cycle static air pressure differential.

H. FS L-S-125B - Screening, Insect, Nonmetallic.

I. AAMA 605.2 - Voluntary Specification for High Performance Organic Coating on Architectural Extrusions and Panels.

J. AAMA 502 - Voluntary Specification for Field Testing of Windows and Sliding Doors.

1.4 SYSTEM DESCRIPTION

A. Windows: Clad wood sections, factory fabricated, vision glass, related flashings, anchorage and attachment devices.

B. Configuration: As indicated on drawings.

1.5 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01300.

B. Product Data: Provide component dimensions, anchorage and fasteners, glass, internal drainage details.

C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work; installation requirements.

D. Submit two (2) samples illustrating window frame section mullion section, screen and frame, factory finished surfaces, glass units, infill panels, glazing materials.

E. Submit two (2) samples of operating hardware.

1.6 SUBMITTALS FOR INFORMATION

A. Submit under provisions of Section 01300.

B. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements. and performance criteria tests.

1.7 QUALITY ASSURANCE

A. Maintain quality work under provisions of Section 01400.

B. Perform Work in accordance with NWWDA IS-2. Maintain one copy of each document on site.

C. Manufacturer and Installer: Company specializing in manufacturing residential commercial wood windows with minimum ten (10) years documented experience.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Transport, handle, store, and protect products under provisions of Section 01600.

B. Protect factory finished surfaces with wrapping and/or strippable coating. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions affecting products on site under provisions of Section 01400.

B. Do not install sealants when ambient temperature is less than 40 degrees F.

C. Maintain this minimum temperature during and after installation of sealants.

PART 2 PRODUCTS

3.1 MANUFACTURERS

A. Andersen Commercial; 400 Series Casement and Specialty Windows.

B. Other acceptable manufacturers:

1. Kolbe & Kolbe Millwork Company., Inc.

2. Pella Horne

3. Marvin Windows and Door

3.2 CASEMENT WINDOWS

A. Frames: Seamless one piece, preformed rigid vinyl frame covered secured to the exterior of the frame with nailing flange. Clear pine interior stops.

B. Sash: Rigid vinyl cladding encasing the entire preservative treated wood sash.

C. Glazing: High-Performance Low E.

D. Weather-stripping: Flexible bulb or black PVC closed cell foam.

E. Screen: Perma-Clean insect screen.

F. Hardware: Andersen Classic Collection with compact operator handle.

G. Interior Trim: Window distributor shall provide jamb extension members at interior window frame perimeter to close off shim space between new window and wall construction. Installation of interior trim by others.

3.3 SEALANT MATERIALS

A. Sealant and Backing Materials: As specified in Section 07900.

3.4 FINISH

A. Rigid vinyl PVC cladding - color as selected by Architect.

B. Interior finish. Job site finish. Finish all exposed unfinished wood. Refer to Section 09900.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate under provisions of Section 01400.

B. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.2 INSTALLATION

A. Install windows in accordance with manufacturer's recommendations and approved shop drawings to achieve weathertight and freely operating installation.

B. Maintain alignment with adjacent work. Secure assembly to framed openings, plumb and square, without distortion.

C. Place insulation in shim spaces around unit perimeter to maintain continuity of building thermal barrier.

D. Install sealant and related backing materials at perimeter of assembly. Refer to Section 07900.

E. Leave window units closed and locked.

3.3 TOLERANCES

A. Windows to accommodate the following opening tolerances:

1. Vertical dimensions between high and low points; plus 1/4" inch or minus 0" inch.

2. Width dimensions; plus 1/4" or minus 0" inch.

3.4 ADJUSTING

A. Adjust installed work under provisions of Section 01700.

B. Adjust hardware for smooth operation and secure weather tight closure.

3.5 CLEANING

A. Clean installed work under the provisions of Section 01700.

B. Remove protective material from factory finished surfaces.

C. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

D. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

SECTION 08700

FRP FLUSH DOORS AND ALUMINUM FRAMING SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. FRP flush doors and aluminum frames with insulated FRP panels. Doors and frames shall be fitted with factory applied weatherstripping as specified herein.

B. The extent of each type of door and frame is shown and scheduled on the drawings.

1.2 RELATED SECTIONS

A. Division 1 – General Requirements

B. Section 07900 - Joint Sealers:

C. Section 08710 - Door Hardware: Templates for hardware attachment and/or reinforcement.

D. Section 08800 - Glazing.

1.3 REFERENCES

A. ANSI A117.1 – Accessible and Usable Buildings and Facilities: Specifications for making buildings and facilities accessible to and usable by physically handicapped people.

B. American Society for Testing and Materials - Testing and material standards.

C. DHI - Door Hardware Institute: The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.

D. NFPA 80 - Fire Doors and Windows.

E. NFPA 252 - Fire Tests for Door Assemblies.

F. SDI-100 - Standard Steel Doors and Frames.

G. UL 10C - Fire Tests of Door Assemblies.

1.4 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01300.

B. Product Data: Indicate frame configuration and finishes.

C. Shop Drawings: Indicate frame elevations, reinforcement, anchor types and spacings, location of cut-outs for hardware, and finish.

1.5 SUBMITTALS FOR INFORMATION

A. Submit under provisions of Section 01300.

B. Submit shop drawings for the fabrication and installation of the doors and frames, and associated components. Details to be shown full scale. Include finish hardware schedule.

C. Product Data: submit manufacturer's product data, specifications and instructions for each type of door and frame required in accordance with the following:

1. Include details of core, stile and rail construction, trim for lites and all other components.

2. Include details of finish hardware mounting.

3. Include samples of each aluminum alloy to be used on this project. Where normal finish color and texture variations are expected, include two or more samples to show the range of such variations.

4. Include one (1) sample of typical fabricated section, showing joints, fastenings, quality of workmanship, hardware and accessory items before fabrication of the work proceeds.

D. Manufacturer's Installation Instructions: Indicate special installation instructions.

1.6 QUALITY ASSURANCE

A. Standards: Comply with the requirements and recommendations in applicable specification and standards by AAMA, except to the extent more stringent requirements are indicated.

B. Performance: a minimum ten (10) year record of production of frames, doors and panels and completion of similar projects in type and size.

C. Instruction: the manufacturer or manufacturer's representative will be available for consultation to all parties engaged in the project including instruction to installation personnel.

D. Field Measurement: field verify all information prior to fabrication and furnishing of materials. Furnish and install materials omitted due to lack of verification at no additional cost to Owner.

E. Regulation and Codes: comply with the current edition in force at the project location of all local, state and federal codes and regulations, including the Americans with Disabilities Act of 1992.

F. Furnish frames and doors from one manufacturer. Splitting of frames and doors will not be permitted.

G. All bidders shall be factory direct authorized distributors of the specified product. Installers shall be as approved by the manufacturer with minimum 3 years experience with projects of similar size and scope.

1.7 REGULATORY REQUIREMENTS

A. Provide door assemblies that have been designed and fabricated to comply with requirements for system performance characteristics listed below, as demonstrated by testing manufacturer's corresponding standard systems according to test methods designated.

B. Thermal Transmission (exterior doors): "U" value of not more than 0.09 (BTH/Hr. x sf x degrees F.) per AAMA 1503.01.

C. Flame Spread / Smoke Developed: Provide FRP doors and panels with the following ratings in according with ASTM E 84-79a:

1. Flame Spread: Not greater than 170 (Class C).

2. Smoke Developed: Not greater than 390 (Class C).

D. Class A option for flame spread and smoke developed rating on interior faces of exterior panels and both faces of interior panel as shown. Flame spread no greater than 15, smoke developed no greater than 310 per ASTM E-84.

E. Additional Criteria: Provide FRP doors and panels with the following performance:

1. ASTM D 256 - nominal value of 20.0

2. ASTM D 570 - nominal value of .20 to 40

3. ASTM D 2583 - nominal value of 50

4. Abrasion Resistance: Face sheet to have no greater than .029 average weight loss percentage after Taber Abrasion Test - 25 cycles at 500 gram weight with H-18 wheel.

5. Stain Resistance: Face sheet to be unaffected after 24 hour exposure to SVS-1 white spray enamel. Must retain DE of .57 of less with MacBeth Colorimeter. Dark Brown (bronze) FRP to be used as a basis.

6. Chemical Resistance: Face sheet to be unaffected after 4 hour exposure to acetic acid (10% solution), acetone, sodium hypochlorite (5.25% solution) and hydrochloric acid (10% solution). No discoloration or panel damage will be allowed.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Deliver, handle, store and protect under provisions of Section 01600.

B. Accept frames on site in manufacturer's packaging. Inspect for damage.

1.9 PROJECT CONDITIONS

A. Coordinate the work with frame opening construction, door, and hardware installation.

B. Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Special-Lite, Inc.

B. Products of the following other manufacturer's meeting specified requirements will also be accepted:

1. Commercial Door Systems

2. Vale Door Solutions

3. Kawneer

C. Substitutions – Permitted under provisions of Section 01600.

2.2 MATERIALS AND ACCESSORIES

A. Aluminum Members: Alloy and temper as recommended by manufacturer for strength, corrosion resistance and application of required finish and control of color; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate with aluminum wall thickness of 0.125".

B. Fasteners: Aluminum, non-magnetic stainless steel or other non-corrosive metal fasteners, guaranteed by the manufacturer to be compatible with the doors, frames, stops, panels, hardware, anchors and other items being fastened. For exposed fasteners (if any) provide Phillips head screws with finish matching the item to be fastened.

2.3 FABRICATION

A. Sizes and Profiles: The required sizes for door and frame units, and profile requirements are shown on the drawings.

B. Coordination of Fabrication: Field measure before fabrication, and show recorded measurements on final shop drawings.

C. Complete the cutting, fitting, forming, drilling and grinding of all metal work prior to assembly. Remove burrs from cut edges, and ease edges and corners to a radius of approximately 1/64".

D. Maintain continuity of line and accurate relation of planes and angles. Secure attachments and support at mechanical joints, with hairline fit at contacting members.

2.4 FIBERGLASS REINFORCED POLYESTER FRP FLUSH DOORS

A. Materials and Construction:

1. Construct 1-3/4" thickness doors of 6063-T5 aluminum alloy stiles and rails minimum 2-5/16" depth. Construct with mitered corners and provide joinery of 3/8" diameter full width tie rods through extruded splines top and bottom as standard. 125" tubular shaped stiles and rails reinforced to accept hardware as specified. Provide hex type aircraft nuts for joinery without welds, glues or other methods for securing internal door extrusions. Furnish integral reglets to accept face sheet to permit a flush appearance. Rail caps or other face sheet capture methods are not acceptable.

2. Extrude top and bottom railings for interlocking continuous rigidity weather bar. Lock face sheet material in place with extruded interlocking edges to be flush with aluminum stiles and rails.

3. Door face sheets: .120" thickness fiberglass reinforced polyester. SL-17 doors with an abuse resistance engineered surface of the standard colors as selected by the Architect.

4. Core of Door Assembly: Minimum 5 lbs/cu.ft. density poured in place polyurethane free of CFC. Minimum “R” value of 11. Ballistic rating is as indicated. Meeting stiles on pairs of doors and bottom weather bar with nylon brush weatherstripping.

5. Manufacture doors with cutouts for vision lites, louvers or panels as scheduled. Factory furnish and install all glass, louvers and panels prior to shipment.

6. Pre-machine doors in accordance with templates from the specified hardware manufacturers and approved hardware schedule. Factory install hardware.

2.5 ALUMINUM FRAMING SYSTEMS

A. Tubular Framing:

B. Framing system from the door manufacturer of the size and type shown. .125" minimum wall thickness and type 6063-T5 aluminum alloy. .625" high applied door stops with screws and weatherstripping. Frame members are to be box type with four (4) enclosed sides. Open back farming will not be acceptable.

C. Caulk joints before assembling frame members. Secure joints with fasteners and provide a hairline butt joint appearance. Prefit doors to frame assembly at factory prior to shipment. Field fabrication of framing using “stick” material is not acceptable.

D. Applied stops for side, transom and borrowed lites and panels, with fasteners exposed on interior or unsecure portion only. Pre-machine and reinforce frame members for hardware in accordance with manufacturer’s standards and the approved hardware schedule. Factory install hardware.

E. Factory preassemble side lites to the greatest extent possible, and mark frame assemblies according to location.

2.6 ALUMINUM FINISHES

A. Anodized Surfaces: AA-M12C22A31 Clear 204-R1*AA-M12C22A41 Clear 215-R1*AA-M12C22A42. Dark Bronze 313.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions to receive work under provisions of Section 01400.

B. Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

A. Comply with manufacturer's recommendations and specifications for the installation of the doors and frames. Factory install hardware, glass and louvers in doors. Factory assemble side lites and transoms to the greatest extent possible.

B. Set units plumb, level and true to line, without warp or rack of doors or frames. Anchor securely in place. Separate aluminum and other metal surfaces with bituminous coatings.

C. Set thresholds in a bed of mastic and backseal.

D. Clean surface promptly after installation of doors and frames, exercising care to avoid damage to the protective coatings.

E. Ensure that the doors and frames will be without damage or deterioration (other than normal weathering) at the time of acceptance.

F. Provide owner with all adjustment tools and instruction sheets. Arrange an inservice session to Owner at Owner's convenience. Provide a minimum one year on all labor related to this section. Any workmanship which is defective or deficient shall be corrected to the Owner's satisfaction and at no additional cost to the Owner.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnish hardware required to complete the work as shown on the drawings and as specified herein;

B. Furnish trim attachments and fastenings, specified or otherwise required, for proper and complete installation.

C. Deliver to the job site those items of finish hardware scheduled to be installed at the job site; and delivered to other points of installation those items of finish hardware scheduled to be factory installed, including:

1. Butt Hinges
2. Continuous Hinges
3. Lock cylinders and keys
4. Lock and latch sets
5. Push/pull units
6. Closers
7. Overhead holders
8. Miscellaneous door control devices
9. Door trim units
10. Protection plates
11. Weather-stripping (except where provided with aluminum entrance doors)
12. Thresholds
13. Wall or floor stops

1.2 RELATED SECTIONS

A. Division 1 – GENERAL REQUIREMENTS

B. Section 08112 – Standard Steel Frames

C. Section 08211 - Wood doors

D. Section 08700 – FRP Flush Doors and Aluminum Entrances

E. Section 08800 – Glazing

F. Division 16 – Electrical

1.3 REFERENCES

A. National Fire Protection Associations (NFPA):

1. NFPA 101-2000, "Life Safety Code"

2. NFPA 80-1999, "Installation of Fire Doors and Windows"

B. Michigan Building Code – Current Edition

C. American National Standards Institute (ANSI):

1. ANSI A 156 Standards series.

2. ANSI A117.1-1998 Accessible and Usable Buildings and Facilities

D. National Electric Code – Current Edition

1.4 DEFINITIONS

A. "Finish Hardware": Items required for swinging, sliding and folding doors, except special types of unique and non-matching hardware specified under door and frame Sections of these Specifications.

1.5 SYSTEM DESCRIPTION

A. Design requirements:

1. Review of hardware requirements:

a. Thoroughly review finish hardware schedule, comparing it with the floor plan, door schedule, and door details to verify hardware requirements, quantities, door swings, finishes, and sizes.

b. If an inconsistency or error in the proposed construction documents is suspected, the hardware supplier is to bring it immediately to the attention of the Architect. If the quantity of items is questioned, for bidding purposes, assume the higher quantity is required and price accordingly.

c. Architect's review of Submittals is for design concept only, and does not relieve the Contractor of the responsibility to furnish sufficient material and functions required for a complete, and code-worthy installation. Determination of all quantities is the responsibility of the Contractor.

B. Performance requirements:

1. Furnish finish hardware complying with the requirements of laws, codes, ordinances and guidelines of governmental authorities having jurisdiction:

a. NFPA 101, "Life Safety Code", 2000 edition

b. NFPA 80, "Installation of Fire Doors and Windows", 1999 edition

c. Michigan Building Code - Current Edition

d. ANSI A117.1-1998 Accessible and Usable Buildings and Facilities

1.6 SUBMITTALS

A. Submit under the provisions of Section 01300.

B. Product data:

1. Initial submittal of the proposed "Finish Hardware Schedule" in the following format:

a. Vertically-typed, double-spaced;

b. Organized into "hardware sets", indicating complete designations of every item required for each door or opening. Include the following information for each item of finish hardware:

1) Manufacturer
2) Type
3) Style
4) Function
5) Size
6) Degree and direction of opening swing (“hand”)
7) Finish
8) Fasteners
9) Location of hardware set cross-referenced to indications on floor plans, door, schedule, and frame schedule.
10) Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
11) Mounting heights and locations for hardware.
12) Door and frame sizes and materials.
13) Keying information.

2. Final Finish Hardware Schedule immediately following receipt of the Architect’s approval of the initial submittal.

C. Samples:

1. When requested by the Architect or Owner, submit one sample of each type of exposed hardware unit, finished as required, and tagged with a full description for coordination with schedule.

2. Samples will be returned to the supplier.

3. Units which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be built into the Work, within limitations of keying coordination requirements.

D. Templates: Furnish hardware templates with final submittal of Finish Hardware Schedule.

E. Contract closeout submittals:

1. Operation and maintenance data: Comply with pertinent provisions of Section 01700.

2. Provide two complete sets of finish hardware schedules, and two complete copies of manufacturer's catalog cuts and maintenance instructions for each item furnished under the Work of this Section.

1.7 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the requirements and the methods needed for proper performance of the work of this Section.

B. Supplier qualifications:

1. A recognized architectural finish hardware supplier with warehousing facilities within a 200 mile radius of the project site and a direct distributor of all products listed on the approved finish hardware schedule.

2. Continuously in business of finish hardware supply for not less than 5 years.

C. Provide the service of a qualified Architectural Hardware Specialist to:

1. Be available for consultation with the Architect at no additional cost to the Owner during progress of construction, and:

a. Inspect installation of all finish hardware items;
b. Make all minor adjustments required; and
c. Report to the Architect on completeness of the installation.

2. The hardware consultant may be an employee of the supplier.

D. Installer qualifications: Employ a competent hardware installer with at least five (5) years experience installing commercial grade hardware similar to that proposed for the Work.

E. Source limitations: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.

F. Mandatory pre-construction meeting:

1. Immediately following the Architect's final approval of the submittals, convene a mandatory pre-installation meeting to be attended by the Architect, Contractor, Installer, Supplier, and the Architect's hardware consultant.

2. Proposed agenda to include review of:

a. The Contract Documents;
b. Installation schedule;
c. Hardware Specifications;
d. Hardware locations and opening descriptions;
e. Special installation instructions;
f. Other items of pertinence to the Work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01600.

B. Product identification:

1. Tag and mark each item separately in manufacturers unopened package, identifying it by product number and architectural opening number, as listed in the approved Finish Hardware Schedule.

2. Include instructions, templates, and fasteners needed for installation.

C. Deliver individually packaged hardware items on a vehicle operated by a direct employee of the Hardware Supplier. Contractor shall immediately, and in the presence of the Hardware Supplier, inventory the contents of the delivery.

D. Hardware supplier: Furnish finish hardware items directly to the factory or mill for factory-installation, where required.

1.9 PROJECT CONDITIONS

A. Provide a secure, dry storage area for the sole purpose of storing finish hardware. Prohibit access to all jobsite personnel, except those employed by the installing contractor.

1.10 WARRANTY

A. Manufacturer's warranty:

1. Warrant all finish hardware items against defects in materials and workmanship for one year.

2. Extended warranty: Extend the above warranty on certain items of finish hardware as follows:

a. Door closers: To ten years
b. Continuous hinges: To ten years
c. Exit devices: To five years
d. Locks and latch sets: To five years

3. Manufacturer agrees to promptly replace (including installation by a factory representative) defective products at no additional cost to the Owner, for the duration of the warranty period.

4. The terms of such warranties extend from the Date of Substantial Completion as that date is defined by the General Conditions.

B. Failures due to defective materials or workmanship is deemed to include, but not to be limited to:

1. Failures in operation of any operating component;

2. Defects which contribute to unsightly appearance, potential safety hazard, or potential untimely failure of the products furnished under this Section.

PART 2 PRODUCTS

2.1 MATERIALS, GENERAL

A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each finish hardware item is indicated in the Finish Hardware Schedule at the end of this Section.

B. Product designations:

1. One or more manufacturers are listed for each hardware type required. Provide the product designated or the comparable product listed under this Section.

C. ANSI/BHMA designations:

1. Used to describe hardware items, or to define quality or function. Provide products complying with these standards in addition to additional requirements of this Section.

D. Hand of door: Drawings show direction of slide, swing ("hand") of door leafs.

E. Hardware: Use hardware manufactured to conform to published templates and, generally, prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.

2.2 MATERIALS

A. Base metals:

1. Manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially-recognized) quality than that specified for applicable hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designations indicated.

2. Do not furnish "optional" materials for those indicated, except as otherwise specified.

B. Fasteners:

1. Furnish Phillips flat-head screws with each hardware item, unless otherwise indicated.

2. Exposed screws: Match finish of hardware (even where noted to be "prepared for paint").

3. Use concealed fasteners for hardware units which are exposed when door is closed, except where no standard units of type specified are available with concealed fasteners.

4. Do not use thru-bolts where bolt head or nut on opposite face would be exposed.

5. Where adequate reinforcement is not feasible, thru-bolting would only be acceptable if through sleeves, or if sex-screw fasteners are used.

C. Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of finish hardware.

2.3 MANUFACTURED UNITS, GENERAL

A. Reference standards:

Item:		Comply with:
1.	Butts and hinges:	ANSI A156.1-1988 (BHMA 101)
2.	Locks and lock trim:	ANSI A156.2-1987 (BHMA 601)
3.	Exit devices:	ANSI A156.3-1989, Grade 1 BHMA 701)
4.	Door controls-closers:	ANSI A156.4-1986,Grade 1 BHMA 301)
5.	Architectural door trim:	ANSI A156.6 (BHMA 1001)
6.	Template hinge dimensions:	ANSI A156.7
7.	Door controls-overhead holders:	ANSI A156.8 (BHMA 311)
8.	Mortise locks and latches:	ANSI A156.13-1987, Grade 1
9.	Auxiliary hardware:	ANSI A156.16-1989(BHMA 1201)

B. Hardware finishes:

1. Materials and Finishes Standard: Comply with ANSI A156.18 (BHMA 1301). Finish designations used in schedules are listed, therein.

2. Provide US32D or US26D at all finish hardware exposed to view on wood door.

3. Provide matching finishes for hardware units at each door, unless otherwise indicated. Generally Dark Bronze.

4. Match the color and texture of hardware items to manufacturer's standard finish for the latchset, lockset, or push-pull unit.

5. Provide quality of finish, including thickness of plating or coating, composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than that specified or described by referenced standards.

C. Hardware for fire-rated openings:

1. Comply with NFPA 80

2. Tested and listed by Underwriters Laboratory (UL), or Factory Mutual (FM) for type, size and use of door, and complying with requirements of door and door frame label.

3. Provide UL or FM label on door indicating "Fire door to be equipped with fire-exit hardware".

4. Provide UL or FM label on exit device indicating "Fire Exit Hardware".

2.2 PRODUCTS

A. Hinges, butts and pivots:

1. General:

a. ANSI A156.1 - 1988 for commercial quality.
b. Provide only template-produced units.
c. All hinges to be concealed bearing-type.
d. Hinges at exterior doors shall be of non-ferrous material.

2. Screws:

a. At metal doors and frames: Machine screws.
b. At wood doors and frames: Phillips flat-head wood screws.
c. Finish screw heads to match surface of hinges or pivots.

3. Pins:

a. Steel hinges: Steel
b. Non-ferrous hinges: Stainless Steel
c. Hinges at exterior doors: Non-removable (NRP)
d. Hinges at out-swing corridor doors: Non-removable (NRP)
e. Hinges at interior doors: Non-rising

4. Tips:

a. Flat button with matching plug
b. Finish to match leaves, except where hospital tip (HT) indicated.

5. Number of hinges: Provide number of hinges indicated but not less than 3 hinges.

6. Hinge sizing:

a. According to hinge manufacturer's recommendation for door size and weight, unless otherwise specified.
b. Hinges for door widths 3 feet, or less: Standard-weight (.134)
c. Hinges for door widths over 3 feet: Heavy-weight (.180) hinges

7. Acceptable products:

a. For interior standard weight hinges:

1) Stanley FBB179
2) Hager BB1279
3) Ives 5BB1

B. Locksets: Shall be Falcon MA Series at Exterior Doors or Sargent 8200, Corbin Russwin ML2000, or Best 45H Series. Interior Doors shall be Falcon T Series or Sargent 10 Line, Corbin Russwin CL3300 Series, or Best 93K.

C. Lock Cylinders and Keying:

1. General:

a. Provide cylinders as required to Key to New Master Key System.

D. Push pulls: 1" round. Pulls 10" c to c. Push Bar to be Centered on Stiles.

E. Door closers: Falcon SC70 Series or SC80 as shown in HW Sets. Equivalent Products shall be Norton 7500, Yale 4400, Sargent 351, or Ryobi D4550 where SC70 are shown and Norton 8500, Yale 3500, Sargent 1430, and Ryobi D3550 where SC80 are shown. Provide all Drop Plates, Brackets and Spacers as required for proper mounting.

F. Overhead Stops: Shall be Glynn Johnson or equivalent by any BHMA manufacturer.

G. Kickplates and Stops: Ives or equivalent by Rockwood or Trimco. Material shall be Stainless Steel (630)

H. Weatherseals and Accoustical Seals: National Guard or Equivalent by Pemko

I. Door Bottom: Steelcraft

2.3 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

2.4 HARDWARE FINISHES

A. General:

1. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible and except as otherwise indicated.

2. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening.

3. In general, match items to the manufacturer's standard finish for the latch and lock set (or push/pull units if no latch/lock sets) for color and texture.

4. Provide finishes matching those established by BHMA or, if none established, match the Architect's sample.

5. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than that specified for the applicable units of hardware by referenced standards.

6. Finish designations used in schedules and elsewhere listed in ANSI A156.18 "Materials and Finishes Standard", including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

B. Provide the following hardware finishes, unless otherwise scheduled:

1.	Hinge	US26D - Satin Chrome or US32D - Satin Stainless Steel
2.	Lock	US26D - Satin Chrome
3.	Cylinder	To match surrounding hardware
4.	Closer	AL - Sprayed Aluminum
5.	Push/pull bar	US32D - Satin Stainless Steel
6.	Kick/mop/armor plate	US32D - Satin Stainless Steel
7.	Wall stops	US32D - Satin Stainless Steel
8.	Overhead stops	US32D - Satin Stainless Steel
9.	Thresholds/door seals	AL - Anodized Aluminum

C. Base material: Manufacturer’s standard high-carbon steel, brass, or bronze.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 COORDINATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.3 INSTALLATION

A. General:

1. Install each item in its proper location firmly anchored into position, level and plumb, and in accordance with the manufacturer's recommendations.

2. Handing, hardware heights, locations, and degree of opening swing are indicated in the Drawings and Finish Hardware Schedule.

3. Mount finish hardware units:

a. At recommended heights and locations as shown in approved finish hardware schedule, complying with requirements of the A.D.A., and pertinent provisions of the Building Code.

b. To function at proper degree of opening of doors as indicated on approved finish hardware schedule.

c. By manufacturer's template.

d. Prior to final finishing of the door. Remove hardware to allow finishing of door, and permanently reinstall hardware upon completion of finishing operation.

4. Reinforce, where necessary, the substrate to assure proper attachment.

5. Drill and countersink units which are not factory-prepared for anchorage fasteners.

6. Space fasteners and anchors in accordance with industry standards.

B. Installing closers:

1. Mount closers per manufacturer's template, and secure the Architect's approval of the closer installation.

2. The Contractor will be required to REPLACE doors onto which closers are improperly mounted at no additional cost to the Owner. Repair or patching of such doors will not be acceptable.

C. Installing thresholds at exterior doors: Set in full bed of butyl-rubber, or polyisobutylene mastic sealant.

3.4 FIELD QUALITY CONTROL

A. Inspection of final hardware installation: The Contractor, hardware suppliers, and Architectural Hardware Consultant (AHC) shall thoroughly check the quality of the installation and the functionality of each unit of finish hardware at all openings in the Work. The Hardware Supplier shall forward a detailed written report of all operational or installation deficiencies to the Architect and Contractor.

3.5 CLEANING AND ADJUSTING

A. Check and adjust each item of hardware and each door upon completion of final installation. Verify proper function, and replace units which cannot be made to operate freely and smoothly, as intended for the application.

B. Clean adjacent surfaces soiled by hardware installation.

3.6 FINISH HARDWARE SCHEDULE

HW SET: 01
DOOR NUMBER:
101.1

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	DORMITORY LOCK	MA571P6 QG	626	FAL
1	EA	SURFACE CLOSER	SC71 SS	689	FAL
1	EA	DOOR SWEEP	C627A	CL	NGP
1	EA	THRESHOLD	425HD	AL	NGP
1	SET	WEATHERSTRIP	WEATHERSTRIP BY DOOR SUPPLIER		

HW SET: 01A
DOOR NUMBER:
122.3 133.1

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	DORMITORY LOCK	MA571P6 QG	626	FAL
1	EA	SURFACE CLOSER	SC71 SS/HO	689	FAL
1	EA	DOOR SWEEP	C627A	CL	NGP
1	EA	THRESHOLD	425HD	AL	NGP
1	SET	WEATHERSTRIP	WEATHERSTRIP BY DOOR SUPPLIER		

HW SET: 02
DOOR NUMBER:
102.1

EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PULL/PUSHBAR	9103EZ-30-0-NO	626	IVE
1	EA	SURFACE CLOSER	4111 SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 03
DOOR NUMBER:
103.1 121.1 125.1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	T101S QUANTUM	626	FAL
1	EA	SURFACE CLOSER	SC81 REG ARM	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 03A
DOOR NUMBER:

104.1	105.1	117.1	118.1	119.1	124.1
127.1	128.1	129.1	130.1	134.1	139.1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	T101S QUANTUM	626	FAL
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 03B
DOOR NUMBER:

131.1	135.1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	T101S QUANTUM	626	FAL
1	EA	SURFACE CLOSER	SC81 REG ARM	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS33X	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 04
DOOR NUMBER:

108.1	110.1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	T561P6D QUANTUM	626	FAL
1	EA	SURFACE CLOSER	SC81 REG ARM	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	5050C	CHA	NGP
1	EA	DOOR BOTTOM	112N	AL	NGP
1	EA	THRESHOLD	410	AL	NGP

HW SET: 05
DOOR NUMBER:

106.1	120.1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY SET	T301S QUANTUM	626	FAL
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 06
DOOR NUMBER:
107.1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	T561P6D QUANTUM	626	FAL
1	EA	SURFACE CLOSER	SC81 REG ARM	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 06A
DOOR NUMBER:
113.1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	T561P6D QUANTUM	626	FAL
1	EA	SURFACE CLOSER	SC81 HD/PA	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 07
DOOR NUMBER:
109.1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	T561P6D QUANTUM	626	FAL
1	EA	SURFACE CLOSER	SC81 SS	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	5050C	CHA	NGP
1	EA	DOOR BOTTOM	112N	AL	NGP
1	EA	THRESHOLD	410	AL	NGP
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 08
DOOR NUMBER:
112.1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	T561P6D QUANTUM	626	FAL
1	EA	OVERHEAD STOP	450S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 08A
DOOR NUMBER:
115.1 116.1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	T561P6D QUANTUM	626	FAL
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 09
DOOR NUMBER:
114.1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	T101S QUANTUM	626	FAL
1	EA	SURFACE CLOSER	SC81 REG ARM	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	5050C	CHA	NGP
1	EA	DOOR BOTTOM	112N	AL	NGP
1	EA	THRESHOLD	410	AL	NGP

HW SET: 09A
DOOR NUMBER:
122.1 122.2 123.1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	T101S QUANTUM	626	FAL
1	EA	SURFACE CLOSER	SC81 REG ARM	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	5050C	CHA	NGP
1	EA	THRESHOLD	410	AL	NGP
2	EA	SWEEP	6MS0002P006	BLK	STE

END OF SECTION

SECTION 08800

GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glass, plastic and glazing.

B. Sliding reception window frame.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 08111 – Standard Steel Doors: Glazed doors.

C. Section 08112 - Standard Steel Frames: Glazed frames and sidelights.

D. Section 08211- Flush Wood Doors: Glazed doors.

E. Section 08700 – FRP Flush Doors and Aluminum Entrances: Glazed doors and frames.

1.3 REFERENCES

A. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.

B. ASTM C920 - Elastomeric Joint Sealants.

C. ASTM C1036 - Flat Glass.

D. ASTM C1048 - Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.

E. ASTM E546 - Test Method For Frost Point of Sealed Insulating Glass Units.

F. ASTM E773 - Test Method for Seal Durability of Sealed Insulating Glass Units.

G. ASTM E774 - Sealed Insulating Glass Units.

H. CPSC (Consumer Products Safety Commission): CPSC 16 CFR 1201.

I. FGMA - Glazing Manual.

J. FGMA - Sealant Manual.

K. SIGMA - Sealed Insulated Glass Manufacturers Association.

L. NFPA 80 - Standard for Fire Doors and Windows.

M. NFPA 257 - Standard for Fire Tests of Window Assemblies.

1.4 PERFORMANCE REQUIREMENTS

A. Provide glass and glazing materials for continuity of building enclosure.

1. In conjunction with materials described in Section 07900, 08111, 08112, 08211 & 08700.

2. To maintain a continuous air barrier throughout the glazed assembly from glass pane to heel bead of glazing sealant.

B. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with applicable codes.

C. Limit glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.

D. Provide fire rated glass and glazing materials for continuity of fire rated assemblies.

1. Provide fire rated assemblies meeting U.L. 9 or NFPA 257.

2. Provide fire rated assemblies installed according to NFPA 80.

1.5 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01300.

B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

1.6 SUBMITTALS FOR INFORMATION

A. Submit under provisions of Section 01300.

B. Certificates: Certify that Products meet or exceed specified requirements.

C. Manufacturer's Certificate: Certify that sealed insulated glass, meets or exceeds specified requirements.

D. Manufacturers Certificate: Certify that fire glass meets or exceeds specified requirements.

1.7 SUBMITTALS FOR CLOSEOUT

A. Submit warranty under provisions of Section 01700.

1.8 QUALITY ASSURANCE

A. Maintain quality under provisions of Section 01400.

B. Perform Work in accordance with FGMA Glazing Manual, FGMA Sealant Manual, SIGMA and Laminators Safety Glass Association - Standards Manual for glazing installation methods.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience and as approved by manufacturer.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions under provisions of Section 01400.

B. Do not install glazing when ambient temperature is less than 50 degrees F.

C. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.10 WARRANTY

A. Provide a five year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

B. Provide a five year warranty to include coverage for delamination of laminated glass and replacement of same.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Primary Glass: Provide products from one of the following:

1. PPG Industries, Inc.

2. Guardian Industries Corporation

3. Ford Glass Division

4. LOF Glass, Inc.

5. AFG Industries, Inc.

B. Clear Float Glass

1. Ford Glass Division

2. Guardian Industries Corp.

3. LOF Glass, Inc.

4. PPG Industries, Inc.

5. AFG Industries, Inc.

C. Tempered Glass

1. HGP Industries

2. Viracon, Inc.

3. Glasstemp

4. Guardian Industries Corp.

5. PPG Industries, Inc.

6. Spectrum Glass Prod.

7. Tempglass

D. Insulated Units

1. HGP Industries

2. Viracon, Inc.

3. Tempglass

4. Guardian Industries Corp.

5. Inde-Pane Companies

6. PPG Industries, Inc.

7. Spectrum Glass Products

E. Fire Safety Glass

1. Technical Glass Products

F. Laminated Safety Glass

1. Oldcastle Glass

2. Vitro

3. Guardian Industries

4. Pilkington

5. PPG Industries, Inc.

G. Or equal

2.2 FLAT GLASS MATERIALS

A. General

1. Unless indicated otherwise, reference numbers used throughout this Specification Section are form ASTM C1036 and C1048. When the end product involves one or more categories, both, the primary glass specifications and the specifications of the additional features or construction shall be met.

B. Clear Float Glass: type I (transparent glass, flat), Class 1 (clear), quality q3 (glazing select).

C. Tempered Glass (Safety Glass): Clear; 1/4" inch thick, Condition C (other than coated glass), kind FT (fully tempered), complying with ANSI Z97.1 and "Federal Consumer Product Safety Commission Standard 16 CFR 1201 Category II," ASTM C1036 and ASTM C1048.

D. Low E Glass: Float Type, tempered,, clear, coating on inner surface, visible light transmittance of 70 percent, solar light transmittance of 33 percent, shading coefficient of 0.44, SHGC of 0.38, when combined with Clear Tempered Glass in a 1" insulated unit. Equal to PPG Industries Solarban 60.

E. Fire Safety Glass: Listed and approved fire-rated clear ceramic glass and/or ceramic glass laminate combination meeting the requirements of CPSC 16 CFR 1201 Catergory II, equal to Fire-lite Plus as manufactured by technical Glass Products. Glazing installation shall be in accordance with manufacturer's requirements and listing agency approvals.

2.3 SEALED INSULATING GLASS MATERIALS

A. Manufacturers:

1. Insulated Glass: Factory fabricated with two panes of glass having a hermetically sealed dehydrated 1/2 inch air space, complying with ASTM E773/E774 Class CBA.

2.4 GLAZING COMPOUNDS

A. Based Face Glazing Compound as recommended by manufacturer for application shown.

B. Polysulfide Sealant: ASTM C920, Type M, Grade NS, Class A, two component; chemical curing, non-sagging type; cured Shore A hardness of 15 to 25; color as selected; compounded by manufacturer specifically for glazing.

2.5 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area. Compatible with sealant / compound used.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, minimum 3 inch long x one half the height of the glazing stop x thickness to suit application. Compatible with sealant / compound used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site conditions under provisions of Section 01400.

B. Verify that openings for glazing are correctly sized and within tolerance.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.2 PREPARATION

A. Prepare substrate under provisions of Section 01400.

B. Clean contact surfaces with solvent and wipe dry.

C. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

D. Prime surfaces scheduled to receive sealant.

E. Install sealant in accordance with manufacturer's instructions.

3.3 GLASS TYPES AND USAGE

A. Glass for Exterior Doors, Sidelights, and Transoms: Shall be one inch thick insulated glass consisting of 1/4 inch thick, tempered, Low E glass outer panel, a 1/2 inch wide hermetically sealed air space, and 1/4 inch thick clear tempered glass inner panel.

B. Glass for interior doors and sidelights in acoustical assemblies: One inch thick insulated glass consisting of two panes of ¼ inch thick clear tempered glass with a 1/2 inch wide hermetically sealed air space.

C. Glass for interior non-fire rated doors and sidelights: Clear 1/4" thick, tempered safety glass.

D. Glass for Interior Fire Rated Doors and Sidelights in same Frame: Fire safety glass.

E. Glass for Fire rated Frames not associated with Doors: Fire safety glass.

3.4 INSTALLATION - EXTERIOR WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

A. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with polysulfide sealant.

B. Apply heel bead of polysulfide sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.

C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.

E. Install removable stops, with spacer strips inserted between glazing and applied stops, 1/4 inch below sight line. Place glazing tape on glazing pane or unit with tape flush with 1/4 inch below sight line.

F. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.

G. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.5 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

A. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sight line.

B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.

D. Install removable stops, spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.

E. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.

F. Trim protruding tape edge.

3.6 CLEANING

A. Clean installed work under provisions of Section 01700.

B. Remove glazing materials from finish surfaces.

C. Remove labels after Work is complete.

D. Clean glass and adjacent surfaces.

3.7 PROTECTION OF FINISHED WORK

A. Protect installed work under provisions of Section 01500.

B. After installation, mark pane with an 'X' by using removable plastic tape or paste. Do not mark heat absorbing or reflective glass units.

END OF SECTION

SECTION 09212

SPRAY ON ACOUSTICAL TREATMENT (SATF)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cellulose insulation sprayed onto underside of gypsum ceiling substrate.

1.2 RELATED SECTIONS

A. Division 1 - General Requirements

B. Section 09260 - Gypsum Board Systems: Substrate construction.

1.3 REFERENCES

A. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot-Plate Apparatus.

B. ASTM C739 - Cellulosic Fiber (Wood Base) Loose Fill Thermal Insulation.

C. ASTM E84 - Surface Burning Characteristics of Building Materials.

D. ASTM E119

E. ASTM E1042.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on insulation materials, describing insulation properties.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

D. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.5 SYSTEMS DESCRIPTION/QUALITY ASSURANCE:

A. Contractor must use a total system, encompassing equipment, fiber and adhesive as supplied and tested by the manufacturer. No substitution may be made.

B. Fibers supplied under this specification shall have each bag coded with the date and lot number of manufacturer and retained samples shall be kept by the manufacturer for not less than one year.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

B. Applicator: Company specializing in performing the work of this section with minimum

three years experience and as approved by manufacturer.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke ratings.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions under provisions of Section 01400.

B. Do not install insulation when ambient and surface temperatures are not in accordance to manufacturers recommendations.

C. Maintain acceptable ambient and substrate surface temperatures prior to, during, and after installation of insulation materials as recommended by the manufacturer.

1.9 SEQUENCING

A. Apply insulation after hangers and supporting clips are installed but before subsequent construction is erected.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. International Cellulose Corporation

B. Substitutions not permitted.

2.2 MATERIALS

A. Cellulose Fiber Insulation: K-13 “fc” treated cellulose fiber, conforming to the following:

B. Light Reflectivity: 73 minimum.

C. NRC: .65 to .90

D. Flame Spread Index: 15 per ASTM E-84 / UL 723.

E. Smoke Developed: 0 per ASTM E-84 / UL 723.

F. Bond Strength: >600 psf per ASTM E-761.

G. Compression Strength: >400 psf per ASTM E-761.

H. Color: white

2.3 ACCESSORIES

A. Primer: As required by insulation manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01400.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit adhesion.

C. The installing contractor shall examine all surfaces and report all unsatisfactory conditions in writing to the General Contractor and Architect. The work shall not proceed until unsatisfactory conditions are corrected.

D. Verify other work on and within spaces to be insulated is complete prior to application.

3.2 PREPARATION

A. Prepare substrate under provisions of Section 01400.

B. Provide masking, drop cloths or other satisfactory coverings for all materials/surfaces which are not to receive insulation so as to prevent damage from overspray.

C. Surfaces to receive spray insulation shall be inspected prior to application to determine if priming/sealing is required to insure bonding and/or to prevent discoloration caused by migratory stains. Prime accordingly.

D. The work shall be coordinated with other trades whose work may be affected or have an effect on the installation of the sprayed cellulose fiber.

3.3 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation to a uniform monolithic density without voids.

C. Apply to a minimum cured thickness of 1”.

D. Installation, clean up and coring shall be accomplished according to the manufacturer's recommendations and common construction standards.

E. Provide natural or mechanical ventilation continuously to properly cure the insulation.

3.4 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.

B. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 09260

GYPSUM BOARD SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal framing and furring.

B. Acoustical insulation.

C. Gypsum board.

D. Taped and sanded joint treatment.

E. Texture finish.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 09307 – Wall Tile: Cementitious backer boards.

C. Section 09900 - Painting: Surface finish.

1.3 REFERENCES

A. ASTM C36 - Gypsum Wallboard.

B. ASTM C79 - Gypsum Sheathing Board.

C. ASTM C442 – Gypsum Backing Board and Core Board.

D. ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.

E. ASTM C514 – Nails for the Application of Gypsum Wallboard.

F. ASTM C557 – Adhesive for Fastening Gypsum Wallboard to Wood Framing.

G. ASTM C630 – Water Resistant Gypsum Backing Board.

H. ASTM C645 – Non-load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.

I. ASTM C665 – Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

J. ASTM C754 - Installation of Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water Resistant Backing Board.

K. ASTM C840 - Application and Finishing of Gypsum Board.

L. ASTM C919 – Use of Sealants in Acoustical Applications.

M. ASTM C931 – Exterior Gypsum Soffit Board.

N. ASTM C1002 - Steel Drill Screws for the Application of Gypsum Board.

O. ASTM E90 - Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

P. ASTM E119 - Fire Tests of Building Construction and Materials.

Q. GA-201 - Gypsum Board for Walls and Ceilings.

R. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.

S. GA-600 - Fire Resistance Design Manual.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate special details associated with acoustical seals.

C. Product Data: Provide data on metal framing, gypsum board, joint tape and decorative finish.

D. Samples: Submit two samples of pre-decorated gypsum board, 12 x 12 inch in size illustrating finish color and texture.

1.5 QUALITY ASSURANCE

A. Maintain quality under provisions of Section 01400.

B. Perform Work in accordance with ASTM C840, GA-201, GA-216 and GA-600.

1.6 QUALIFICATIONS

A. Maintain quality under provisions of Section 01400.

B. Applicator: Company specializing in performing the work of this section with minimum three years experience and as approved by manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS - GYPSUM BOARD SYSTEM

A. United States Gypsum Co.

B. Gold Bond Building Products

C. Georgia Pacific Corporation

D. Or equal

2.2 FRAMING MATERIALS

A. Studs and Tracks: ASTM C645; galvanized sheet steel, 25 gage minimum; C shape, with knurled faces.

B. Shaft Wall Studs and Track: ASTM C645; galvanized sheet steel, 25 gage minimum, C-T shape.

C. Furring, framing and Accessories: Same material as studs, “Z” furring member, depth as indicated, thickness to suit application.

D. Resilient Furring: Same material as studs, RC-1 resilient furring channel.

E. Fasteners: ASTM C1002. Self drilling, self tapping screws.

F. Anchorage to Substrate: Drilled expansion anchors.

G. Adhesive: ASTM C557

2.3 GYPSUM BOARD MATERIALS

A. Standard Gypsum Board: ASTM C36; 1/2 inch and 5/8 inch thick, maximum permissible length; ends square cut, tapered edges.

B. Fire Rated Gypsum Board: ASTM C36; fire resistive type, UL rated 5/8 inch thick, maximum permissible length; ends square cut, tapered edges.

2.4 SPRAYED-ON TEXTURE FINISH (KNOCK-DOWN)

A. Sheetrock Brand Multi-Purpose Wall and Ceiling Spray Texture or equal.

2.5 SPRAYED-ON TEXTURE FINISH (STF)

A. Sheetrock Brand Ceiling Spray Texture, Medium Aggregated (QT Polystyrene Medium) or equal.

2.6 ACCESSORIES

A. Acoustical Insulation: ThermaFiber SAFB as manufacturered by USG; ASTM C665; paperless, semi-rigid, preformed glass fiber, 3" thick, batts 1" wider than stud cavity for creased installation in accordance the Gypsum Construction Handbook guidelines.

B. Acoustical Sealant: Non-hardening, non-shrinking, for use in conjunction with gypsum board; Sheetrock Brand Acoustical Sealant by USG or equal; ASTM C919.

C. Corner Beads: Metal.

D. Edge Trim: GA 201 and GA 216; Type LC.

E. Expansion Joint: Manufacturer's standard control joint for finish with joint compound and sealant.

F. Joint Materials: ASTM C475; reinforcing tape, joint compound, adhesive, and water.

G. Fasteners: ASTM C1002, Type S12.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site conditions under provisions of Section 01400.

B. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.

3.2 METAL STUD INSTALLATION

A. Install studs in accordance with ASTM C754.

B. Metal stud spacing 16 inches on center.

C. Extend stud framing through ceiling to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners. Where required, provide supplemental framing as necessary to offset framing around structural member supporting deck.

D. Blocking: Install treated wood blocking for support of wall mounted cabinets and other items or accessories.

3.3 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: In accordance with manufacturer's installation instruction.

3.4 ACOUSTICAL ACCESSORIES INSTALLATION

A. Install resilient channels at maximum 16 inches on center. Locate joints over framing members.

B. Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.

C. Field score SAFB insulation full height along the center, 1 inch deep.

D. Install acoustical sealant with at gypsum board perimeter in accordance with ASTM C919. Caulk all penetrations of partitions by conduit, pipe, ductwork, and rough-in boxes.

3.5 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with GA-201, GA 216, and GA-600.

B. Erect single layer standard gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Erect single layer fire rated gypsum board with edges and ends occurring over firm bearing.

D. Use screws when fastening gypsum board to framing.

E. Double Layer Applications: Secure second layer to first with fasteners.

F. Place second layer perpendicular to first layer. Offset joints of second layer from joints of first layer.

G. Place control joints consistent with lines of building. Maximum spacing between control joints as recommended by manufacturer.

H. Place corner beads and trim at external corners and exposed ends as indicated. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials as indicated.

I. Install cementitious backing board in accordance with manufacturer's instructions.

J. Apply gypsum board to curved walls in accordance with GA-216.

3.6 JOINT TREATMENT

A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.

C. Taping, filling, and sanding is required on exposed surfaces.

D. Taping, filling is required on all concealed surfaces.

3.7 SPRAYED-ON CEILING TEXTURE FINISH (KNOCK-DOWN)

A. Apply texture to substrate using hopper and manufacturer's recommended spray equipment to produce spatter texture.

B. During the setting process, knock-down high surfaces of texture using flexible, broad blade acrylic knife.

3.8 SPRAYED-ON TEXTURE FINISH (STF)

A. Apply texture to substrate using hopper and manufacturer's recommended spray equipment to produce spatter texture.

3.9 TOLERANCES

A. Maintain tolerances under provisions of Section 01400.

B. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09306

FLOOR TILE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ceramic tile floor and base.

B. Quarry tile floor and base.

C. All special corner (both interior/external) shapes, coves, bullnose and other shapes as required and/or indicated.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 03300 - Cast in Place Concrete: Expansion / Control joint components.

C. Section 07900 - Joint Sealers: Mildew resistant sealant.

D. Section 09307 - Wall Tile.

E. Section 09650 - Resilient Flooring: Transition to/from.

F. Section 09688 - Carpet: Glue down, transition to/from.

G. Division 15000 - Mechanical; Plumbing: Floor drains.

1.3 REFERENCES

A. ANSI A108.1 - Installation of Ceramic Tile with Portland Cement Mortar.

B. ANSI A108.3 - Quarry Tile and Paver Tile Installed With Portland Cement Mortar.

C. ANSI A108.4 - Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting Epoxy Adhesive.

D. ANSI A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.

E. ANSI A108.10 - Installation of Grout in Tilework.

F. ANSI A118.1 - Dry-Set Portland Cement Mortar.

G. ANSI A118.4 - Latex-Portland Cement Mortar.

H. ANSI A118.6 - Ceramic Tile Grouts.

I. ANSI A136.1 - Organic Adhesives for Installation of Ceramic Tile

J. ANSI A137.1 - Standard Specifications for Ceramic Tile.

K. TCA (Tile Council of America) - Handbook for Ceramic Tile Installation (most recent Edition).

1.4 SUBMITTALS FOR APPROVAL

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, and setting details.

C. Product Data: Provide instructions for using adhesives and grouts.

D. Samples: Mount tile and apply grout on two plywood panels, illustrating pattern, color variations, and grout joint size variations.

E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.5 SUBMITTALS AT CLOSEOUT

A. Submit under provisions of Section 01700.

B. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.6 QUALITY ASSURANCE

A. Maintain quality under provisions of Section 01400.

B. Perform Work in accordance with ANSI A108.1.

C. Conform to TCA Handbook and ANSI A108.1.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing the work of this section with minimum three years experience and as approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

B. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions under provisions of Section 01400.

B. Do not install adhesives in an unventilated environment.

C. Maintain 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.1 CERAMIC TILE MATERIALS

A. Manufacturers

1. American Olean Tile Co., Inc.

2. United States Ceramic Tile Company

3. Summitville Tile, Inc.

4. Dal-Tile Corporation

5. Or equal

B. Ceramic Floor Tile: ANSI A137.1, conforming to the following:

1. Size: 4 x 4 x 1/4 inch

2. Shape: square

3. Edge: cushioned

4. Surface Finish: slip resistant

5. Color: as selected

C. Base: Matching floor tile, conforming to the following:

1. Height: 4 inch

2. Top Edge: Square where abutting wall tile

3. Internal Corner: coved

4. External Corner: bullnosed

5. Color: matching selected floor tile

2.2 PORCELAIN TILE

A. Porcelain Floor Tile: “Tundra” simulated slate as manufactured by American Florium (no substitutions) ; ANSI A137.1, conforming to the following:

1. Size: 18 x 18 x 1/4 inch

2. Shape: square

3. Edge: square

4. Surface Finish: unpolished

5. Color: as selected

B. Base: Fabricated from cut tile, conforming to the following:

1. Height: 4 inch

2. Top Edge: bull nosed

3. Internal Corner: square

4. External Corner: bullnosed

5. Color: matching selected floor tile

2.3 ADHESIVE MATERIALS

A. Organic Adhesive: ANSI A136.1, Type II in dry locations, thin set bond type.

2.4 MORTAR MATERIALS

A. Manufacturers of Mortar and Grout Materials:

1. American Olean Tile Co., Inc.

2. H.B. Fuller Company

3. Laticrete International, Inc.

4. Mapei Corporation

5. Summitville Tile, Inc., Upco Co. Division, Emhart Corporation

B. "Dry Set" Mortar Materials: ANSI A118.1 Dry Set, Portland cement, sand, latex additive, and water.

2.5 GROUT MATERIALS

A. Grout: Commercial latex - Portland Cement Grout with sand formulated for the tile application utilized, color as selected by Architect.

B. Sealant: Silicone sealant, moisture and bacteria resistant type, as specified in Section 07900, color as selected by Architect.

2.6 ACCESSORIES

A. Waterproof Membrane - (Use at shower areas): ANSI A118.10 Liquid Applied.

B. Thresholds at changes in floor finishes: Extruded aluminum, with integral edge strip, where floor tile abuts dissimilar flooring materials (i.e., carpeting, VCT, wood flooring).

C. Thresholds at shower openings and door openings in rooms with floor drains: Marble type, honed finish 4 x 1/2 inch size by full width of opening. Beveled both sides to meet ADA / Michigan Barrier Free requirements.

2.7 MORTAR MIX AND GROUT MIX

A. Mix and proportion pre-mix setting bed and grout materials in accordance with manufacturer's instructions and TCA Handbook.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate under provisions of Section 01400.

B. Verify that surfaces are ready to receive work.

3.2 PREPARATION

A. Prepare substrate under provisions of Section 01400.

B. Protect surrounding work from damage or disfiguration.

C. Vacuum clean surfaces and damp clean.

D. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.3 FLOOR TILE SETTING METHODS

A. Concrete Subfloors;

1. New Slabs on Grade (Thin-Set Method Method): TCA F113 Latex-Portland Cement Mortar Bonded.

2. Shower Areas (Thin-Set Method): TCA F-122 Latex-Portland Cement Mortar Bonded

3.4 INSTALLATION - THIN SET METHODS

A. Install waterproof membrane (as applicable) per manufacturer’s instructions and in accordance with ANSI A108.13.

B. Install adhesive tile and grout to TCA Handbook method.

C. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

D. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align floor, base and wall joints.

E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

F. Sound tile after setting. Replace hollow sounding units.

G. Keep control joints free of adhesive or grout. Apply sealant to joints.

H. Allow tile to set for a minimum of 48 hours prior to grouting.

I. Grout tile joints.

J. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.5 CLEANING

A. Clean work under provisions of 01700.

B. Clean tile and grout surfaces.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.

B. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09307

WALL TILE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cementitious backer board.

B. Ceramic tile wall.

C. Special shapes, coves, corners, and angles as required and/or indicated.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 07900 - Joint Sealers: Mildew resistant sealant.

C. Section 09306 - Floor Tile.

1.3 REFERENCES

A. ANSI A108.1 - Installation of Ceramic Tile with Portland Cement Mortar.

B. ANSI A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.

C. ANSI A108.10 - Installation of Grout in Tilework.

D. ANSI A118.4 - Latex-Portland Cement Mortar.

E. ANSI A118.6 - Ceramic Tile Grouts.

F. ANSI A136.1 - Organic Adhesives for Installation of Ceramic Tile.

G. ANSI A137.1 - Standard Specifications for Ceramic Tile.

H. TCA (Tile Council of America) - Handbook for Ceramic Tile Installation.

1.4 SUBMITTALS FOR APPROVAL

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, and setting details.

C. Product Data: Provide instructions for using adhesives and grouts.

D. Samples: Mount tile and apply grout on two plywood panels, illustrating pattern, color variations, and grout joint size variations.

E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements, ANSI A137.1.

1.5 SUBMITTALS FOR CLOSEOUT

A. Submit under provisions of Section 01700.

B. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.6 QUALITY ASSURANCE

A. Maintain quality under provisions of Section 01400.

B. Perform Work in accordance with ANSI A137.1.

C. Conform to TCA Handbook, and ANSI A108.1.

1.7 QUALIFICATIONS

A. Maintain quality under provisions of Section 01400.

B. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

C. Installer: Company specializing in performing the work of this section with minimum three years experience and as approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Transport, deliver, store, protect and handle products to site under provisions of Section 01600.

B. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions under provisions of Section 01400.

B. Do not install adhesives in an unventilated environment.

C. Maintain 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.1 CERAMIC TILE MATERIALS

A. Manufacturers

1. American Olean Tile Co., Inc.

2. United States Ceramic Tile Company

3. Summitville Tile, Inc.

4. Dal-Tile Corporation

5. Or equal

B. Ceramic Mosaic Wall Tile: ANSI A137.1, conforming to the following:

1. Size: 4 x 4 x 1/4 inch

2. Shape: square

3. Edge: cushioned

4. Surface Finish: glazed

5. Color: as selected by Architect

C. Wainscot Cap: Match mosaic wall tile, surface finish, and color, tile length, 4 inch long x 2 x 1/4 inch high, bull nosed top edge.

2.2 PORCELAIN TILE

A. Porcelain Floor Tile: “Tundra” simulated slate as manufactured by American Florium (no substitutions) ; ANSI A137.1, conforming to the following:

1. Size: 12 x 12 x 1/4 inch

2. Shape: square

3. Edge: cushioned

4. Surface Finish: unpolished

5. Color: as selected

2.3 MORTAR MATERIALS

A. Mortar Materials: ANSI A118.4 Latex, Portland cement mortar.

2.4 GROUT MATERIALS

A. Grout: ANSI A118.6, tile grout, color as selected.

2.5 ACCESSORIES

A. Waterproof Membrane: 4 mil polyethylene sheet.

B. Reinforcing Mesh: 2 inch glass fiber mesh tape.

C. Backing Board: High density, cementitious, 1/2 thick; 2 inch wide coated glass fiber tape for joints and corners; Hardibacker Cement Board as manufactured by James Hardie Building Products, Durock as manufactured by USG, or equal.

2.6 MORTAR MIX AND GROUT MIX

A. Mix and proportion pre-mix setting bed and grout materials in accordance with TCA Handbook.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate under provisions of Section 01400.

B. Verify that surfaces are ready to receive work.

C. Verify that all blocking for attachment of wall mounted accessories is in place prior to beginning work of this section.

3.2 PREPARATION

A. Prepare substrate under provisions of Section 01400.

B. Protect surrounding work from damage or disfiguration.

C. Vacuum clean surfaces and damp clean.

D. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

E. Install waterproof membrane over metal studs in wet areas.

3.3 INSTALLATION - CEMENTITIOUS BACKER BOARD

A. Install boards parallel to framing members. All parallel edges must be supported over framing members.

B. Score and snap sheets to required sizes and make necessary cutouts.

C. Install sheets 1/4" above floor.

D. Fasten cement board with screws a maximum of 8" around perimeter all supporting studs. Keep fasteners 3/8" from sheet edges and 2" from sheet corners.

E. Set fastener heads flush with the surface, without overdriving.

F. Fill all joints with mortar.

G. Embed joint tape in the mortar and level.

3.4 INSTALLATION - THINSET METHOD

A. Install adhesive tile and grout to TCA Handbook Method Number W202 or W244 as applicable.

B. Install waterproof membrane in accordance with manufacturer’s instructions and ANSI A108.13.

C. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

D. Cut and fit tile tight to penetrations through tile. Form corners neatly. Align floor, base and wall joints.

E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

F. Form internal angles square and external angles bullnosed.

G. Install ceramic accessories rigidly in prepared openings.

H. Sound tile after setting. Replace hollow sounding units.

I. Continue all expansion, control, construction, and cold joints in substrate through tile work.

J. Keep control joints free of adhesive or grout. Apply sealant to joints.

K. Allow tile to set for a minimum of 48 hours prior to grouting.

L. Grout tile joints.

M. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.5 CLEANING

A. Clean work under provisions of Section 01700.

B. Clean tile and grout surfaces.

END OF SECTION

SECTION 09511

SUSPENDED ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Suspended metal grid ceiling system and perimeter trim.

B. Acoustical tile and panels.

1.2 RELATED SECTIONS

A. Division I - General Requirements

1.3 REFERENCES

A. ASTM C635 - Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

B. ASTM C636 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

C. ASTM E1264 - Classification of Acoustical Ceiling Products.

D. Ceilings and Interior Systems Contractors Association (CISCA) - Acoustical Ceilings: Use and Practice.

1.4 SYSTEM DESCRIPTION

A. Suspension system to rigidly secure acoustical ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on metal grid system components, acoustical units and panels.

C. Samples: Submit two samples 4 x 4 inch in size illustrating material and finish of acoustical units.

D. Samples: Submit two samples each, 8 inches long, of suspension system main runner, cross runner, edge trim, and accessories.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.6 QUALIFICATIONS

A. Maintain quality under provisions of Section 01400.

B. Grid Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

C. Acoustical Unit Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions under provisions of Section 01400.

B. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.8 SEQUENCING

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, overhead work is completed, tested, and approved, and wall finishes are completed.

B. Install acoustical units following inspection and approval by Office of Fire Safety.

1.9 EXTRA MATERIALS

A. Furnish under provisions of Section 01700.

B. Provide 2 cartons of each tile type; extra tile and panels to Owner.

PART 2 PRODUCTS

2.1 MANUFACTURERS - SUSPENSION SYSTEM

A. Armstrong World Industries, Chicago Metallic Corporation

B. USG Interior Systems

C. National Rolling Mills Company

2.2 SUSPENSION SYSTEM MATERIALS

A. Non-fire Rated Grid: ASTM C635, intermediate; components die cut and interlocking. Equal to "Prelude" as manufactured by Armstrong World Industries.

B. Exposed Grid Surface Width: 15/16 inch

C. Grid Finish: White.

D. Accessories: Stabilizer bars, clips, splices, edge moldings, bull nose corner trim and hold down clips required for suspended grid system.

E. Support Channels and Hangers: Galvanized steel; size and type to suit application, and ceiling system flatness requirement specified.

2.3 MANUFACTURERS - ACOUSTICAL UNITS

A. USG Interior Systems.

B. Or equal.

2.4 ACOUSTICAL UNIT MATERIALS

A. Acoustical Tile (SAT-1): ASTM E1264, Type III, Form 2, Pattern CDE, Equal to “Radar” as manufactured by USG Interior Systems.

1. Size: 24 inches x 48 inches

2. Thickness: 5/8 inches

3. Composition: Mineral fiber

4. Light Reflectance: 80 percent minimum

5. Fire Hazard Classification: Class A

6. Edge: SQ

7. Surface Color: White

8. Surface Finish: Perforated (small holes), fissured, lightly textured.

2.5 ACCESSORIES

A. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site conditions under provisions of Section 01400.

B. Verify that layout of hangers will not interfere with other work.

C. Verify that layout is in accordance with reflected ceiling plan. Notify Architect of conflicts in conditions.

3.2 INSTALLATION - LAY-IN GRID SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636 and as supplemented in this section.

B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.

C. Locate system according to reflected plan.

D. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.

E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support components and light fixtures independently.

H. Do not eccentrically load system, or produce rotation of runners.

I. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.

J. Install bullnose corner edge molding trim at all bullnose corners.

K. Suspension system is intended to support acoustical units only. All mechanical and electrical components are to be supported independently of grid system.

L. Grid support wires are to be attached to structural members by means of a manufacture approved anchor solely intended to support grid systems. The use of inverted grid tees to suspend support wire is prohibited.

3.3 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units one way with pattern parallel to shortest room axis. Fit border trim neatly against abutting surfaces.

D. Install units after above ceiling work is complete, inspected, and approved by governing authorities.

E. Install acoustical units level, in uniform plane, and free from twist, warp and dents.

F. Cut tile to fit irregular grid and perimeter edge trim.

3.4 ERECTION TOLERANCES

A. Maintain installation tolerances under provisions of Section 01400.

B. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

C. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09650

RESILIENT FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Resilient transitions.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 09306 – Floor Tile: Marble threshold transition to floor tile.

C. Section 09260 - Gypsum Board Systems: Wall materials to receive application of base.

1.3 REFERENCES

A. ASTM E84 - Surface Burning Characteristics of Building Materials.

B. ASTM F1066 - Vinyl Composition Floor Tile.

C. FS L-F-475 - Floor Covering, Vinyl Surface (Tile and Roll), with Backing.

D. FS SS-W-40 - Wall Base: Rubber and Vinyl Plastic.

1.4 SUBMITTALS FOR APPROVAL

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate borders and patterns.

C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.

D. Samples: Submit two samples, 2 x 2 inch in size illustrating color and pattern for each floor material for each color specified.

E. Submit two 2 inch long samples of base material for each color.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.5 SUBMITTALS AT CLOSEOUT

A. Submit under provisions of Section 01700.

B. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame/smoke rating requirements of in accordance with ASTM E84.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Transport, deliver, store, protect and handle products to site under provisions of Section 01600.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions under provisions of Section 01400.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

C. Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.1 MATERIALS - TILE FLOORING

A. Vinyl Composition Tile: FS SS T 312b Type IV, Composition I. Patterns and colors as selected by Architect.

1. Size: 12 x 12 inch

2. Thickness: 1/8 inch

3. Design: plain

4. Manufacturers:

a. Armstrong, Style; Standard Excelon

b. Mannington, Style; Essentials Tile

2.2 MATERIALS – BASE

A. Base: FS SS-W-40, Type 2 vinyl; Vinyl; top set coved. Patterns and colors as selected by Architect.

1. Height: 4 inch

2. Thickness: 1/8 inch thick

3. Length: 4 foot sections

4. Manufacturers:

a. Burke Flooring Products

b. Johnsonite - Johnson Rubber Company

c. Kentile Floors, Inc.

2.3 MATERIALS – MISCELLANEOUS

A. Provide miscellaneous vinyl transitions and edging as required for a complete installation. Provide resilient materials of the same manufacturer and color as base.

2.4 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

C. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine project conditions under provisions of Section 01400.

B. Verify concrete floors are dry to a maximum moisture content of 7 percent, and exhibit negative alkalinity, carbonization, or dusting.

C. Verify floor and lower wall surfaces are free of substances that may impair adhesion of new adhesive and finish materials.

3.2 PREPARATION

A. Prepare substrate under provisions of Section 01400.

B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is cured.

D. Vacuum clean substrate.

E. Apply primer to surfaces.

3.3 INSTALLATION - TILE FLOORING

A. Install in accordance with manufacturer's instructions.

B. Mix tile from container to ensure shade variations are consistent when tile is placed.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Set flooring in place, press with heavy roller to attain full adhesion.

E. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.

F. Install tile to basket weave pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

G. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.

H. Install metal edge strips at unprotected or exposed edges, and where flooring terminates.

I. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

J. Install feature strips, edge strips, and floor markings where indicated. Fit joints tightly.

3.4 INSTALLATION – BASE

A. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.

B. Miter internal corners. Wrap base around bullnose CMU at external corners.

C. Install base on solid backing. Bond tight to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

E. Install base on all casework kick boards.

3.5 CLEANING

A. Clean work under provisions of 01700.

B. Remove access adhesive from floor, base, and wall surfaces without damage.

C. Clean, seal, and wax floor and base surfaces in accordance with manufacturer's instructions.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.

B. Prohibit traffic on floor finish for 48 hours after installation.

END OF SECTION

SECTION 09670

FLUID-APPLIED FLOORING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes fluid-applied flooring and base.

B. Related Sections:

1. Section 07900 - Joint Sealers: Joint between base and wall surface.

2. Section 09650 – Resilient Flooring: Termination edging of adjacent floor finish.

1.2 REFERENCES

A. ASTM International:

1. ASTM D256 – Standard Test Method for Impact Resistance of Plastics and Electrical Insulating Materials.

2. ASTM D412 – Standard Test Method for Vulcanized Rubber and Thermoplastic Elastomers – Tension.

3. ASTM D624 – Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.

4. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.

5. ASTM D790 – Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulation Materials.

6. ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness.

7. ASTM D7234 – Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on specified products, describing physical and performance characteristics; sizes, patterns and colors and available.

C. Samples: Submit samples illustrating color and pattern for selection.

D. Manufacturer’s Certificate: Certify products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention

1.4 CLOSEOUT SUBMITTALS

A. Section 01700 - Execution Requirements: Closeout procedures.

B. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Product storage and handling requirements.

B. Store resin materials in dry, secure area.

C. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01400 - Product Requirements.

B. Maintain minimum temperature required by manufacturer in storage area.

C. Maintain ambient temperature required by manufacturer prior to, during, and after installation of materials for period of time recommended by manufacturer.

PART 2 PRODUCTS

2.1 FLUID-APPLIED FLOORING

A. Manufacturers:

1. Vortex Sprayliners, Inc.

2. Substitutions: Not Permitted.

2.2 COMPONENTS

A. Fluid-Applied Flooring: Polyurethane / Polyurea blended base component with a low viscosity, non-temperature sensitive isocyanurate catalyst formulation.

1. Base Coat: 1/8 inch thick; color as selected.

2. Top Coat: Two part aliphatic urethane coating.

3. Non-slip Surfacing: Ceramic granules; color as selected.

4. Hardness of Material: Shore D Hardness >55 in accorndnace with ASTM D2240.

5. Tensile Strength: >3,205 psi in accordance with ASTM D638.

6. Elongation: 275% in accordance with ASTM D412.

7. Tear Resistance Factor: 475 PLI (Tear) in accordance with ASTM D624.

8. Flexural Modulus (Compaction/Impact Factor): >52,000 PSI in accordance with ASTM D790.

9. Impact Resistance: 4.5 ft-lbs in accordance with ASTM D256.

10. Impact Resistance @ -40F: 0.4 ft-lbs in accordance with ASTM D256.

2.3 ACCESSORIES

A. Primers and Adhesives: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01400 - Administrative Requirements: Coordination and project conditions.

B. Verify floor surfaces are smooth and flat with maximum variation as specified in Section 03300 and are ready to receive work.

C. Verify concrete floors have cured minimum 28 days and are acceptable to flooring manufacturer.

D. Verify floor and lower wall surfaces are free of substances capable of impairing adhesion of adhesive and finish materials.

3.2 PREPARATION

A. Tape , mask, cover and protect adjacent surfaces to prevent overspray.

B. Prepare surfaces as required by manufacturer.

C. Clean substrate.

D. Apply primer in accordance with manufacturer’s instructions.

3.3 INSTALLATION

A. Apply each coat of flooring within thickness range required by manufacturer.

B. Apply base coat, finish coat and non-slip finish in accordance with manufacturer’s instructions.

C. Finish to smooth level surface.

3.4 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01700 - Execution Requirements: Protecting installed construction.

B. Barricade area to protect flooring until cured.

END OF SECTION

SECTION 09770

SPECIAL WALL SURFACING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Special wall surfaces, including fiberglass reinforced plastic panels.

1.2 RELATED SECTIONS

A. Division 1 – General Requirements

B. Section 09260 – Gypsum Board Systems: Gypsum board substrate.

1.3 REFERENCES

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. ASTM International and pertinent tests:

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics

D. ASTM D790 - Flexural Strengths (psi) & Flexural Modulus (psi)

E. ASTM D2583 - Barcol Hardness

F. ASTM D638 - Tensile Strengths (psi) & Tensile Modulus (psi)

G. ASTM D256 - Izod Impact Strengths (ft #/in)

H. ASTM D696 - Thermal Coefficient of Lineal Expansion (in/in/F°)

I. ASTM D570 - Water Absorption (%)

J. ASTM D792 - Specific Gravity

K. S102-M88 - CAN/ULC Fire Ratings

L. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyster Wall and Ceiling Panels.

1.4 SYSTEM DESCRIPTION

A. Performance Requirements: Provide fiberglass reinforced plastic (FRP) panels which have been manufactured to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Submit product data, including manufacturer's SPEC-DATA® product sheet, for specified products.

C. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures. Indicate location and dimension of joints and fastener attachment.

D. Samples: Submit selection and verification samples for finishes, colors and textures. Submit 2 samples of each type of panel, trim and fastener.

E. Quality Assurance Submittals: Submit the following:

F. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

G. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics, criteria and physical requirements.

H. Manufacturer's Instructions: Manufacturer's installation instructions.

1.6 CLOSEOUT SUBMITTALS

A. Submit in accordance with provisions of Section 01700.

B. Operation and Maintenance Data: Operation and maintenance data for installed products. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

C. Warranty: Warranty documents specified herein.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Installer Qualifications: Installer should be experienced in performing work of this section and should have specialized in installation of work similar to that required for this project.

2. Manufacturer Qualifications: Manufacturer should be capable of providing field service representation during construction and should be capable of approving application method.

1.8 DELIVER, STROAGE, AND PROTECTION

A. Deliver, store and protect products under provisions of Section 01600.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Package sheets on skids or pallets for shipment to site.

D. Storage and Protection: Store panels and accessories dry and indoors. Store material to protect from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

E. Handling: Remove foreign matter from face of panel by using a soft cloth or brush to avoid scratching or abrasions.

1.9 PROJECT CONDITIONS

A. Environmental Requirements:

1. Installation shall not begin until building is fully enclosed, permanent heating and cooling equipment is in operation for a period of time sufficient to stabilize interior temperature and humidity.

2. During installation, and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of.

3. Provide ventilation to disperse fumes during application of adhesive as recommended by adhesive manufacturer's instructions.

B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.10 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Marlite, Inc.; Standard FRP Panels

B. Or Equal

2.2 FIBERGLASS REINFORCED PLASTIC (FRP) PANELS

A. Color: to be selected from manufacturer's standard colors.

B. Surface textures: Pebbled

C. Fire Rating: Class C (III) Fire Rating.

D. Size: 4' x 8'

2.3 ACCESSORIES

A. Extruded PVC Trims

1. Inside Corner

2. Outside Corner

3. Division

4. Edge

B. Extruded PVC to be color-thru.

C. Adhesives and sealants as approved by FRP Manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate under provisions of Section 01400.

B. Confirm that substrate is smooth, solid, flat, clean and ready to receive wall panels.

3.2 PREPARATION

A. Panels should be opened and allowed to acclimate for 48 hours prior to installation. The building shall be closed with HVAC operational and conditioned to final use ambient humidity and temperature. Room temperature should be approximately 65° F or above before beginning installation.

3.3 INSTALLATION

A. Install products and accessories in strict accordance with the manufacturer's installation instructions, using manufacturer recommended adhesives and sealants.

B. All moldings must provide for a minimum 1/8 inch of panel expansion at joints and edges, to insure proper installation.

3.4 CLEANING

A. Wipe down using a damp cloth and mild soap solution or cleaner. Refer to manufacturer's specific cleaning recommendations

END OF SECTION

SECTION 09900

PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation and field application of paints and coatings.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 04300 – Unit Masonry Systems: Masonry surfaces requiring field painting.

C. Section 05311 – Steel Floor Deck: Steel decking requiring field painting.

D. Section 05500 – Metal Fabrications: Miscellaneous metal items requiring field painting.

E. Section 05511 – Metal Stairs: Metal stair components requiring field painting.

F. Section 05520 – Handrails and Railings: Handrails and guards requiring field painting.

G. Section 06200 – Finish Carpentry: Finish carpentry items requiring field finish.

H. Section 07620 – Sheet Metal Flashing and Trim: Flashing and trim items requiring field finish.

I. Section 08111 – Standard Steel Doors: Hollow metal doors requiring field painting.

J. Section 08112 - Standard Steel Frames: Hollow metal frames requiring field painting.

K. Section 08305 – Access Doors: Steel access doors requiring field painting.

L. Section 08610 – Wood Windows: Wood windows requiring field finish.

M. Section 09260 - Gypsum Board systems: Gypsum board surfaces requiring field painting.

N. Division 15: Mechanical items requiring field painting.

O. Division 16: Electrical items requiring field painting.

1.3 REFERENCES

A. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.

B. ASTM D2016 - Test Method for Moisture Content of Wood.

C. NPCA (National Paint and Coatings Association) - Guide to U.S. Government Paint Specifications.

D. PDCA (Painting and Decorating Contractors of America) - Painting - Architectural Specifications Manual.

E. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual.

1.4 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on all finishing products in a schedule format listing each paint system, coat, and applicable Federal specification number for each system coat.

C. Samples: Submit two samples, illustrating range of colors and textures available for each surface finishing product scheduled.

D. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.

1.6 QUALIFICATIONS

A. Maintain quality control under provisions of Section 01400.

B. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

C. Applicator: Company specializing in performing the work of this section with minimum three years experience and as approved by manufacturer.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke rating requirements for finishes.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Transport, deliver, store, protect and handle products to site under provisions of Section 01600.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

C. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

D. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions under provisions of Section 01400.

B. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside

the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Minimum Application Temperature for Varnish and Stain Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

F. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.10 EXTRA MATERIALS

A. Furnish under provisions of Section 01700.

B. Provide 1 gallons of each color, type, and surface texture to Owner.

C. Label each container with color, type, texture, room locations, in addition to the manufacturer's label.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers – Paint

1. Glidden Coatings and Resins

2. Benjamin Moore and Company

3. PPG Industries, Pittsburg Paints

4. Pratt & Lambert

5. Sherwin - Williams Company

6. Valspar Corporation

7. DeVoe & Reynolds Company

8. The O'Brien Corporation

2.2 MATERIALS

A. Coatings: Ready mixed. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.

B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

C. Patching Materials: Latex filler.

D. Fastener Head Cover Materials: Latex filler.

2.3 FINISHES

A. Exterior Paint Systems (EPS-1):

1. System EPS-1: Gloss Alkyd Enamel:

a. 1st Coat; (Primer):

i. Ferrous Metal: Red oxide primer (TT-P-645).

ii. Galvanized Metal: Galvanized primer (TT-P-641).

b. 2nd Coat and 3rd Coat:

i. Gloss Alkyd Enamel (TT-E-489, Class A).

2. Apply to the following scheduled exterior surfaces:

a. Miscellaneous metal items.

b. All grills, registers, and diffusers specified to be field finished.

c. Gas piping and meter.

d. Bollards and guard posts.

B. Interior Paint Systems IPS-1:

1. Latex Base, Satin Finish:

a. 1st Coat; (Primer):

i. Gypsum Drywall: Latex Primer (TT-P-650).

ii. Concrete Masonry Units: Surface Filler (TT-F-1098).

iii. Concrete: Latex Primer (TT-P-650).

b. 2nd Coat and 3rd Coat: Latex base emulsion, semi-gloss (TT-P-1511). Color as selected by Architect.

2. Apply to the following interior surfaces as scheduled:

a. Walls and ceiling surfaces scheduled to receive IPS-1.

C. Interior Paint System IPS-2:

1. System IPS-2; Epoxy Paint, Gloss, Solvent Based: Equal to Sherwin Williams – Tile Clad II.

a. 1st Coat; Primer/Sealer epoxy solvent based.

b. 2nd and 3rd Coats: Epoxy Paint (7 mills total); color as selected by

Architect.

2. Apply to the following interior surfaces as scheduled:

a. Walls surfaces scheduled to receive IPS-2.

D. Interior Paint System IPS-3:

1. Semi-Gloss Enamel:

a. 1st Coat; (Primer)

i. Ferrous metal: Red oxide primer (TT-E-506).

ii. Galvanized metal: Galvanized primer (TT-P-641).

b. 2nd Coat: Ferrous Metal and Galvanized Metal: Enamel Undercoater (TT-E-543).

c. 3rd Coat: Odorless Alkyd Enamel, Semi-Gloss (TT-E-509).

2. Apply to the following interior surfaces:

a. Hollow metal doors and frames.

b. Miscellaneous steel and metal items exposed to view except as noted otherwise.

c. Access doors exposed to view.

d. Exposed to view mechanical and electrical items specified to be field finished.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site conditions under provisions of Section 01400.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Plaster and Gypsum Wallboard: 12 percent.

2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.

3. Interior Wood: 15 percent, measured in accordance with ASTM D2016.

4. Exterior Wood: 15 percent, measured in accordance with ASTM D2016.

5. Concrete Floors: 8 percent.

3.2 PREPARATION

A. Prepare surfaces to receive work under provisions of Section 01400.

B. General:

1. Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified for each particular substrate condition.

2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.

3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.

4. Protect floors and installed finish materials in areas where paint is being applied with clean drop cloths or other suitable methods.

5. Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

C. Correct defects and clean surfaces which affect work of this section. Remove existing coatings that exhibit loose surface defects.

D. Seal with shellac and seal marks which may bleed through surface finishes.

E. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Aluminum Surfaces: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

G. Asphalt, Creosote, or Bituminous Surfaces: Remove foreign particles to permit adhesion of finishing materials. Apply compatible sealer or primer.

H. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

I. Concrete Floors: Remove contamination, acid etch, and rinse floors with clean water. Verify required acid-alkali balance is achieved. Allow to dry.

J. Copper Surfaces Scheduled for Paint Finish: Remove contamination by steam, high pressure water or solvent washing. Apply vinyl etch primer immediately following cleaning.

K. Copper Surfaces Scheduled for a Natural Oxide Finish: Remove contamination by applying oxidizing solution of copper acetate and ammonium chloride in acetic acid. Rud on repeatedly for required effect. Once attained, rinse surfaces with clear water and allow to dry.

L. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

M. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

N. Concrete and Unit masonry Surfaces: remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

O. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

P. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

Q. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

R. Interior Wood Surfaces Schedule to Receive Paint: Remove dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand between coats.

S. Interior Wood Surfaces Scheduled to Receive Transparent Finish: Remove dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.

T. Exterior Wood Scheduled to Receive Paint: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior caulking compound after primer coat has been applied.

U. Exterior Wood Scheduled to Receive Transparent Finish: Remove dust; grit, and foreign matter; seal knot holes, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior caulking compound after sealer has been applied.

V. Glue Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dust.

3.3 APPLICATION

A. Apply products in accordance with manufacturer’s instructions.

B. Do not apply finishes to surfaces that are not dry.

C. Apply each coat to uniform finish.

D. Apply each coat slightly darker than preceding coat unless otherwise approved.

E. Sand wood and metal lightly between coats to achieve required finish.

F. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.

G. Allow applied coat to dry before next coat is applied.

H. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

I. Prime concealed surfaces of interior and exterior woodwork with primer paint.

J. Prime concealed surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

3.4 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Divisions 15 and 16 for schedule of color coding and identification banding or equipment, duct work, piping, and conduit.

B. Paint shop primed equipment. Paint shop prefinished items occurring at finished interior areas where specified.

C. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

D. Prime and paint insulated and exposed pipes, conduits, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.

E. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint, to visible surfaces. Paint dampers exposed behind louvers, and grilles to match face panels.

F. Paint exposed conduits and electrical equipment occurring in finished areas.

G. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

H. Color code equipment, piping, conduit, and exposed duct work in accordance with requirements indicated. Color band and identify with flow arrows, and names.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.5 CLEANING

A. Clean work under provisions of 01500.

B. Collect waste material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

END OF SECTION

SECTION 10105

VISUAL DISPLAY BOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surfaced metal dry marker boards.

B. Tackboards.

C. Tackboard Cases.

D. Trim, chalkrail, and accessories.

1.2 RELATED SECTIONS

A. Division I - General Requirements: Substrate Construction.

B. Section 09111 – Metal Framing: Wood blocking.

1.3 REFERENCES

A. AHA A135.4 - Basic Hardboard.

B. ASTM A424 - Steel Sheets for Porcelain Enameling.

C. ASTM A526 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.

D. ASTM B209 - Aluminum-Alloy Sheet and Plate.

E. ASTM B221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.

F. ASTM C36 - Gypsum Wallboard.

G. ASTM C208 - Insulation Board (Cellulose Fiber) Structural and Decorative.

H. ASTM C543 - Slate Blackboards.

I. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

J. FS CCC-W-408 - Wall Covering, Vinyl-Coated.

K. FS L-P-1040 - Plastic Sheets and Strips, Polyvinyl Floride.

L. HPMA HP - Hardwood and Decorative Plywood.

M. NPA A208.1 - Mat Formed Wood Particleboard.

N. PEI (Porcelain Enamel Institute) - Performance Specifications for Porcelain Enamel Chalkboards.

O. PS 1 - Construction and Industrial Plywood.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.

C. Product Data: Provide data on chalkboards, tackboards, tackboard surface covering, and trim and accessories.

D. Samples: Submit two samples illustrating materials and finish, color and texture of chalkboard, tackboard, and tackboard surfacing.

1.5 SUBMITTALS AT CLOSEOUT

A. Submit under provisions of Section 01700.

B. Maintenance Data: Include data on regular cleaning and stain removal.

C. Warranty: Submit extended warranty as specified.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame/smoke rating of vinyl fabric covered tackboards in accordance with ASTM E84.

1.7 QUALIFICATIONS

A. Maintain quality control under provisions of Section 01400.

B. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.8 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.9 WARRANTY

A. Provide warranty under provisions of Section 01700.

B. Warranty: Provide five year warranty including coverage of markerboard surface from discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Polyvision Corp. (Greensteel Inc.)

B. AARCO Products, Inc.

C. Claridge Products and Equipment, Inc.

D. Or equal.

2.2 TACK BOARD CASES

A. Equal to Greensteel Model CR recessed mounted, hinged, single door bulletin board case.

B. All exposed metal shall be extruded aluminum 6063-T5 alloy, anodized satin finish.

C. Door shall be 1/4" tempered safety glass framed with heavy aluminum channels reinforced at all corners, not dependent upon glass for rigidity.

D. Door shall be equipped with continuous piano hinge, lock and keys.

E. Rear wall of case shall be fitted with vinyl tackboard.

2.3 MARKER BOARD MATERIAL

A. Sheet Steel: ASTM A424, Type I, commercial quality.

B. Finish: Fused ceramic finish equal to “Porcelain Plus” as manufactured by Alliance.

2.4 TACKBOARD SURFACING MATERIAL

A. Tackboard Covering: FS CCC-W-408; Type I - light; Class 1 - regular; color as selected by Architect.

2.5 CORE AND FRAME MATERIALS

A. Particle Board: NPA A208.1, wood chips, set with waterproof resin binder, sanded faces.

B. Foil Backing: Aluminum foil sheet, .015 inch thick.

C. Frame and Chalkrail: Aluminum extrusions.

2.6 ACCESSORIES

A. Fasteners and Adhesives: Type used by manufacturer.

B. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.

C. Cleaning Instruction Plate: Provide instructions for chalkboard cleaning on a plastic plate fastened to perimeter frame near chalkrail.

2.7 FABRICATION - DRY MARKER BOARDS

A. Outer Face Sheet: Steel, 24 gage.

B. Core: Particle board, 3/8 inch thick.

C. Backing Surface: Aluminum sheet, 0.015 inch thick.

D. Splice Joint: Extruded aluminum exposed H type.

2.8 FABRICATION – TACKBOARDS

A. Core: "Dura Core", 3/8 inch thick.

2.9 FABRICATION - FRAME AND TRIM

A. Aluminum Frame: Manufacturers standard profile; fasteners, map rail with cork insert over chalkboard, and tackboard surfaces.

B. Aluminum Chalkrail: Manufacturers standard profile, one piece full length of writing surface, closed ends; exposed fasteners.

2.10 FINISHES

A. Porcelain Enamel: Glass fibered enamel, baked to vitreous surfaces; Porcelain Enamel Institute Type A; color as selected by Architect.

B. Tackboard Surface: Vinyl of color as selected by Architect.

C. Aluminum Frame , Chalkrail, and Accessories: Mill finish natural aluminum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site conditions under provisions of Section 01400.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings and instructed by the manufacturer.

C. Verify flat wall surface for frameless adhesive applied type.

3.2 INSTALLATION

A. Install chalkboards, and tackboards in accordance with manufacturer's instructions.

B. Establish bottom of perimeter frame as indicated.

C. Secure units level and plumb.

D. Chalkboards: Butt panels tight with concealed spline to hairline joint.

3.3 CLEANING

A. Clean work under provisions of 01700.

B. Clean chalkboard surfaces in accordance with manufacturer's instructions.

3.4 PROTECTION

A. Protect work under provisions of Section 01500.

B. Cover chalkboard surfaces with protective cover, taped to frame.

C. Remove temporary protective cover at date of Substantial Completion.

END OF SECTION

SECTION 10441

IDENTIFICATION SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Acrylic / Phenolic Identification Signs

B. Cast Commemorative Plaque

1.2 DESCRIPTION OF WORK

A. Provide room identification signs as specified at each interior door where indicated on the plans.

B. Provide parking lot and site signs where shown on the drawings.

1.3 RELATED SECTIONS

A. Division I - General Requirements

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate sign styles, lettering font, foreground and background colors, locations, overall dimensions of each sign.

C. Samples: Submit two sample signs, in size type, style, letter font, and colors selected for approval.

D. Manufacturer's Installation Instructions: Include installation template and attachment devices.

1.5 QUALIFICATIONS

A. Provide quality assurance under provisions of Section 01400.

B. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.6 REGULATORY REQUIREMENTS

A. American With Disabilities Act (ADA) Requirements: Manufacturer shall conform with ADA requirements. ADA requirements shall supersede technical specifications of this section. Manufacturer's shall conform to tactile, braille, letter size, and other requirements as may be required by ADA Accessibility Guidelines For Buildings and Facilities, Article 4.30 Signage.

B. Michigan Building Code - current Edition.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

B. Package signs, labeled in name groups.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions under provisions of Section 01400.

B. Do not install signs when ambient temperature is lower than recommended by manufacturer.

C. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. Witvoet & sons, Grand Rapids, MI; Telephone: 616 / 534-6677.

B. Or equal

2.2 IDENTIFICATION SYSTEMS:

A. Provide room identification signs of the size and type shown.

1. Include room name accompanied by Braille as required by ADA.

2. Include International Barrier Free symbol of compliance where required by the Michigan Building Code.

B. Cast Commemorative Plaque

1. Fabricate cast metal commemorative plaques of the size, shape and thickness required or as shown. Provide units free of pits, scale and sand holes or other defects, with the required raised letters, number and characters. Hand tool and buff to provide clean, sharp figures with bright finish. Provide background texture and finish as indicated, or if not indicated, as selected by the Architect from manufacturer's standards. Protect the exposed surfaces with 2 coats of clean, non-yellowing lacquer.

2. Use Architectural Bronze (85-5-5-5) alloy unless otherwise acceptable to the Architect.

3. Commemorative Plaque to be 18" x 24" in size with raised letters and edges. Plague to identify the name of the Project, date of construction, name of Superintendent, names of Board of Education Members, name of Architect, MEP Engineer, and name of General Contractor.

2.3 ACCESSORIES

A. Mounting Hardware: As recommended by manufacturer for substrate conditions.

PART 3 EXECUTION

3.1 INSTALLATION - INTERIOR ROOM SIGNAGE

A. Install in accordance with manufacturer's instructions.

B. Install signs after surfaces are finished, in locations indicated.

C. Locate sign on wall surface level, adjacent to latch side of doors, at 60 inches above finish floor. Where no wall space if available on the latch side of doors mount signage on the nearest adjacent wall. Obtain Architect approval of non-standard signage location prior to installation.

END OF SECTION

SECTION 10522

FIRE EXTINGUISHERS AND ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire extinguishers.

B. Accessories.

1.2 RELATED SECTIONS

A. Division I - General Requirements

1.3 REFERENCES

A. NFPA 10 - Portable Fire Extinguishers.

B. UL 8 - Foam Fire Extinguishers.

C. UL 92 - Fire Extinguisher and Booster Hose.

D. UL 154 - Carbon Dioxide Fire Extinguishers.

E. UL 299 - Dry Chemical Fire Extinguishers.

F. UL 626 - 2 1/2 Gallon Stored Pressure, Water Type Fire Extinguishers.

G. UL 711 - Rating and Fire Testing of Fire Extinguishers.

H. UL 1093 - Halogenated Agent Fire Extinguishers.

1.4 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01300.

B. Product Data: Provide extinguisher operational features, color and finish, and anchorage details.

1.5 SUBMITTALS FOR INFORMATION

A. Submit under provisions of Section 01300.

B. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

A. Submit under provisions of Section 01700.

B. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.7 QUALITY ASSURANCE

A. Maintain quality assurance under provisions of Section 01400.

B. Provide units conforming with UL standards.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable code NFPA 10, 10A, and 10L for requirements for extinguishers.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions under provisions of Section 01400.

B. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. J.L. Industries

2. Larsen's Manufacturing Co.

3. Profile International Inc.

4. The Ansul Company

5. Or equal.

2.2 EXTINGUISHERS

A. Dry Chemical Type: UL 299, Cast steel tank with pressure gage, hose and horn; Class A:B:C, Size as shown in the drawings.

2.3 ACCESSORIES

A. Extinguisher Brackets: Designed to fit extinguisher and hold extinguisher firmly and securely. Brackets shall be equal to J.L Industries "Mark" type.

B. Extinguisher Cabinet: Designed to fit extinguisher equal to J.L. Industries “Clear VU G25" Series. Stainless steel trim and door material, flat trim for recessed mount and surface mount trim for surface mount. Provide with fire rated FX option for recessed mount.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure rigidly in place.

C. Place extinguishers and accessories as indicated.

END OF SECTION

SECTION 10800

TOILET AND BATH ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Toilet and washroom accessories.

B. Grab bars.

C. Attachment hardware.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 09260 – Gypsum Board Systems: Wood blocking for mounting accessories.

1.3 REFERENCES

A. ANSI A117.1 - Safety Standards for the Handicapped.

B. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

C. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

D. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

E. ASTM A366 - Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.

F. ASTM B456 - Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable requirements under provisions of Section 01400.

B. Toilet accessories shall conform with American w/Disabilities Act requirements and ANSI A117.1 Accessible and Usable Buildings and Facilities requirments. ADA and ANSI A117.1 requirements shall supercede technical specifications of this section.

1.6 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on product data.

1.7 COORDINATION

A. Coordinate work under provisions of Section 01039.

B. Coordinate the work with the placement of reinforcement of toilet partitions to receive anchor attachments.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide washroom accessories from one of the following approved manufacturers.

1. Bradley

2. Bobrick Washroom Equipment, Inc.

3. American Standard

4. Or equal.

2.2 ACCESSORIES

A. Paper Towel Dispenser (PTD/D recessed): Recessed combination towel dispenser and waste receptacle fabricated of type 304 (18-8), stainless steel with exposed surfaces in satin finish. Door of nonflexing construction, equipped with full length piano hinge and tumbler lock. Towel dispenser capacity 475 multi-fold or 350 C-fold towels. Removable 2 gal. Stainless steel waste receptacle. Equal to Bradley Model 2291.

B. Toilet Tissue Dispenser (TTD): Surface mounted single roll toilet tissue dispenser of chrome plated cast brass. Equal to Bradley Model 508.

C. Grab Bars (BFGB): 1-1/2" O.D. concealed mounting heavy duty stainless steel grab bar with safety-grip peened finish stainless steel in sizes and configurations shown. Mounting flanges shall be fabricated of type 304, 11 gauge stainless steel and shall be 3-1/8" diameter. Escutcheons shall be fabricated of type 304, 22 gauge stainless steel, one piece drawn construction with exposed surfaces in architectural satin finish. Escutcheons shall snap securely over mounting flange. Grab bars shall be fabricated from type 304, 18 gauge stainless steel, seamless construction. Bent ends of tubing shall pass through flanges and be heliarc welded to form a single structural unit. Where required, intermediate supports shall be contour cut and joined by heliarc welding to form an integral part of the grab bar. All welds to be ground and finished to match adjacent finish.

1. Grab Bars at Water Closets: Bradley Model 8120-0013600 (rear wall), Model 8120-0014200 (side wall horizontal), and Model 8120-0011800 (side wall vertical).

2. Grab Bars at Shower: Bradley Model 8120-0593030 (control wall and sidewall horizontal) and Model 8120-0011800 (control wall vertical).

D. Mirrors (MIR): Mirror shall be 18" x 30" size and shall be framed with heavy-gauge, one piece roll-formed stainless steel angle 3/4" x 3/4" with corners heliarc welded and ground smooth to a satin finish. Double strength continuous integral stiffener on all sides for added strength. Bevel on front of angle secures frame flush against mirror. Back shall be

fabricated of 20-gauge galvanized steel, secured to frame with concealed screws, equipped with integral horizontal hanging brackets. Mirror shall be first quality 1/4" float glass protected by a shock absorbing neoprene tubing. Wall hanger shall be cold rolled 18 gauge steel. Equal to Bradley Model 780.

E. Feminine Napkin Disposal (FND): Surface-mounted sanitary napkin disposal shall be type-304 22 gauge stainless steel with all-welded construction; exposed surfaces shall have satin finish. Cover shall be fabricated of type 304 22 gauge stainless steel and secured to container with a full-length stainless steel piano-hinge. Cover shall have integral finger tab for opening cover. Equal to Bradley Model 4781-15.

F. Soap Dispenser (SD): Surface mounted liquid soap dispenser fabricated of 20 guage satin finish stainless steel. Dispenser shall have completely concealed mounting, vandal-resistant filler hole cover and sight gauge. Push-in corrosion-resistant liquid soap valve operating with less than 5 lbs. of force. Capacity: 40 oz. liquid soap. Equal to Bradley Model 6562.

G. Folding Shower Seat (FSS): Reversible folding white phenolic shower seat shall be fabricated of 1/2 inch thick phenolic with Melamine bonded to its phenolic core. Secured to the frame of 18 gauge, 1” diameter tubing, and 16 gauge u-channel. Support leg contained in 16 gauge lower support bracket. Frame, mounting flanges, and lower support bracket fabricated from Type 304 stainless steel. Equal to Bradley Model 9569.

H. Shower Curtain Rod/Curtain/Hooks (SCR): Concealed mounted shower curtain rod shall be fabricated of type 304 (18-8), 18 gauge stainless steel of seamless construction. Mounting flanges shall be of glass polypropylene with snap-on vandal-resistant protective escutcheons. Equal to Bradley Model 9538-36. Shower curtain shall be 6 gauge vinyl material with hemmed top edges and aluminum grommets at 6 inch centers. Equal to Bradley Model 9533-36. Provide required number of shower curtain hooks, stainless steel spring wire with snap fastener. Equal to Bradley Model 9536.

I. Robe/Towel Hook (RT/H): Surface mounted, fabricated of type 304, heavy gauge No. 4 satin finish stainless steel with concealed mount. Equal to Bradley Model 9314.

2.3 MATERIALS

A. Sheet Steel: ASTM A366.

B. Stainless Steel Sheet: ASTM A167, Type 304.

C. Tubing: ASTM A269, stainless steel.

D. Adhesive: Two component epoxy type, waterproof.

E. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof.

F. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.4 FABRICATION

A. Weld and grind joints of fabricated components, smooth.

B. Form exposed surfaces from single sheet of stock, free of joints. Form surfaces flat without distortion. Maintain surfaces without scratches or dents.

C. Fabricate grab bars of tubing, free of visible joints, return to wall with end attachment flanges. Form bar with 1 1/2 inches clear of wall surface. Peened grip surfaces.

D. Shop assemble components and package complete with anchors and fittings.

E. Provide steel anchor plates, adapters, and anchor components for installation.

2.5 KEYING

A. Supply three (3) keys for each accessory to Owner.

B. Master key all accessories.

2.6 FINISHES

A. Galvanizing: ASTM A123 to 1.25 oz/sq.yd. Galvanize ferrous metal and fastening devices.

B. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and baked.

C. Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats baked enamel.

D. Chrome/Nickel Plating: ASTM B456, Type SC 2 satin finish.

E. Stainless Steel: No. 4 satin luster finish.

F. Back paint components where contact is made with building finishes to prevent electrolysis.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site conditions under provisions of Section 01400.

B. Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings.

C. Verify exact location of accessories for installation.

3.2 PREPARATION

A. Prepare substrate under provisions of Section 01400.

B. Deliver inserts and rough-in frames to site for timely installation.

C. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions.

B. Install plumb and level, securely and rigidly anchored to substrate.

END OF SECTION

SECTION 12300

MANUFACTURED CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shop fabricated casework.

B. Countertops.

C. Cabinet hardware.

D. Pre-finished surfaces.

E. Preparation for installing utilities.

1.2 RELATED SECTIONS

A. Division I - General Requirements

B. Section 06200 - Finish Carpentry: Installation of cabinets in conjunction with reception counter.

C. Section 07900 - Joint Sealers.

D. Division 16: Interior Lighting; Power, signal and lighting data wiring.

E. Division 16: Telephone and Data Communications Systems rough-in.

1.3 REFERENCES

A. ANSI A135.4 - Basic Hardboard.

B. ANSI A208.1 - Mat Formed Wood Particleboard.

C. AWI (Architectural Woodwork Institute) - Quality Standards.

D. BHMA A156.9 - Cabinet Hardware.

E. FS MMM-A-130 - Adhesive, Contact.

F. NEMA (National Electric Manufacturers Association) LD3 - High Pressure Decorative Laminates.

G. NHLA (National Hardwood Lumber Association).

H. PS 1 - Construction and Industrial Plywood.

I. PS 20 - American Softwood Lumber Standard.

J. WIC (Woodwork Institute of California) - Manual of Millwork.

1.4 SUBMITTALS FOR REVIEW

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit full selection of 1 1/2 inch x 2 inch size samples of plastic laminate.

E. Samples: Submit two samples of drawer pulls and hinges, and illustrating hardware finish.

1.5 QUALITY ASSURANCE

A. Maintain quality assurance under provisions of Section 01400.

B. Perform work in accordance with AWI Custom quality.

C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years experience.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Transport, deliver, store and protect under provisions of Section 01600.

B. Protect units from moisture damage.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions under provisions of Section 01400.

B. During and after installation of work of this section, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.

PART 2 PRODUCTS

2.1 GENERAL

A. Decorative laminate casework features:

1. M-3 47# density engineered particleboard

2. PVC edges applied with hot melt

3. Epoxy coated, self closing, 100# rated drawer slides with lifetime warranty

4. Non-Racking, Non-Deflecting Platform Drawer Box With 1/2” Thick Bottoms. Blum Metabox drawer system is acceptable.

5. High pressure laminates cold press applied with rigid PVA glue

6. Thermally Fused Laminate Interior Which Exceeds NEMA LD3-1995 for GP-28 Performance

7. Separate individual, factory applied, Full Support Base Construction

8. Approved alternate manufacturers:

2.2 MANUFACTURERS

A. Manufacture:

1. Case Systems

B. Products meeting specified requirements for the following manufacturers are also be acceptable:

1. Balon Manufacturing

2. Meyer Cabinets and Countertops

3. Cedar Valley Cabinets

2.3 MATERIALS:

A. Exterior Vertical Surfaces:

1. All door and drawer fronts, finished end panels, and exposed exterior backs shall be surfaced with .028” thick high-pressure decorative laminate conforming to NEMA LD3-1995, GP-28.

2. A minimum of 300 solid colors and 6 woodgrains shall be offered. A maximum of 5 colors may be selected per project. Solid colors shall be from Wilsonart “Color Quest”, Formica “Color Portfolio” or Pionite “Solid Colors”.

3. All exterior vertical high-pressure laminate panels shall be balanced with textured .020” thick high- pressure cabinet liner conforming to NEMA Standard LD3-1995, CL-20. Color shall match interior, Light Beige, Greystone, or White.

4. All high-pressure laminate must be laminated using a PVA adhesive, set under pressure, resulting in a rigid glue line. Contact adhesives shall not be used.

5. HPL at all open interiors, underside of wall cabinet bottoms, interiors of glazed door cabinets shall be considered exposed and finished in Decorative High-Pressure GP-28 laminate.

B. Thermally Fused Interiors at Semi-Exposed Surfaces:

1. Interior surfaces behind doors, drawer boxes, backs, and unfinished ends shall be laminated with a Light Beige, Greystone, or White thermally fused laminate that meets or exceeds the performance standards for NEMA LD3-1995 for GP-28. All panels shall be of “BALANCED” construction. Fast cycle thermally fused, melamine foil or polyester surfaced panels or other surface types that do not meet these requirements are not acceptable.

2. 3mm & .020” PVC Edges:

a. Door and drawer edging shall be 3mm PVC. The PVC shall be applied utilizing hot melt adhesive and radiused by automatic trimmers. Hand tool applying and trimming of PVC shall not be allowed. Edging shall be available in Twenty coordinated color options. One selection per color cabinet color scheme.

b. Other edges shall be machine applied color through .020” PVC. Cabinet body edges shall match the door/drawer edge color selection. The leading edge of adjustable shelves shall be edged with .020” PVC matching the interior color.

C. Particleboard:

1. All particleboard shall be Grade M-3 Industrial, according to the American National Standard (ANSI) for Mat-Formed Wood Particleboard, ANSI-A208.1-1993 and shall meet or exceed the following:

a.	Density	47 lbs/cu.ft.
b.	Moisture Content	6%
c.	Modules of Rupture	2400 psi
d.	Modules of Elasticity	450,000 psi
e.	Internal Bond	80 psi
f.	Hardness	900 pounds
g.	Linear Expansion	0.30%
h.	Thickness Tolerance	+/- 0.005”
i.	Face Screw Holding	325 pounds
j.	Edge Screw Holding	275 pounds

D. Hardware

1. Pulls:

a. One pull shall be located at the centerline of the drawer, regardless of width, to ensure ease of operation and maximize drawer slide life. A minimum of twenty four options shall be available. One selection per cabinet color scheme.

2. 5 Knuckle Hinges:

a. Hinges shall be .95” steel five-knuckle hospital-tip institutional grade quality with .187” diameter tight pin. Residential, kitchen type pivot, plain butt, or hinges with removable pins “SHALL NOT BE ACCEPTABLE”. Each hinge shall be secured with a minimum of nine No. 8 screws. Hinge shall permit door to swing 270 degrees without binding. Doors less than 48” in height shall have two hinges. Doors over 48” in height shall have three hinges. A minimum of three finishes shall be available. One per project.

3. Drawer Slides:

a. Standard Drawer: Self closing, bottom mount epoxy coated with captive roller and positive in stop. Slide shall have 100# rating, must be self closing within last 3” of travel, and must prevent drawer fronts from contacting the cabinet body.

b. File Drawers: Full extension, bottom mount epoxy coated with captive roller and positive instop. Slide shall have 100# rating, must be full extension, and prevent drawer fronts from contacting the cabinet body.

c. File drawers shall be equipped with “Pendaflex” file frames.

4. Door Catches:

a. Base and Wall Cabinets: 7 pound magnetic catch.

b. Tall Cabinets: Heavy duty spring loaded roller, with molded plastic bumper.

5. Adjustable Shelf Supports:

a. Shelf supports shall be injected molded clear plastic, with a double pin engagement 32mm on center and shall have 3/4” and 1” anti-tip locking tabs.

6. Locks: (Where shown or noted only)

a. National Lock five disc tumbler cam locks in chrome finish

b. All locks keyed alike, or keyed differently by room and master keyed.

c. Lock core is removable with a control key, permitting OWNER to easily change lock arrangements without tools.

d. Inactive door of base and wall cabinets shall be secured by using an elbow catch or a chain bolt for tall cabinets.

2.4 CONSTRUCTION:

A. All cabinet body components shall be secured using manufacturer’s standard fabrication method.

B. All joints are tight fitting and will not rupture or loosen due to the following:

1. Dimensional changes in the particleboard.

2. Racking of casework during shipment and installation.

3. Normal use.

4. Seismic shock as tested and approved by the Woodwork Institute of California for casework used in schools and hospitals.

5. All fastening devices and screws shall be treated to deter or resist corrosion.

C. Construction Features -- All Cabinets:

1. All structural components shall be 3/4” thick particleboard with balanced surfaces.

2. All back panels shall be 1/2” thick particleboard surfaced both sides for balanced construction.

3. All drawer components shall be 1/2” thick particleboard with balanced surfaces.

4. Mounting stretchers are 3/4” thick structural components fastened to end panels by mechanical fasteners, and are concealed by the cabinet back.

5. When cabinet backs are exposed a finished 3/4” thick decorative laminate back panel shall be substituted for stretchers.

6. Particleboard core individual bases, factory applied to base and tall cabinets shall support and carry the load of the end panels, and the cabinet bottom, directly to the floor. The base shall be let in from the sides and back of the cabinet to allow cabinets to be installed tightly together and tight against a wall. Also to conceal the top edge of applied vinyl base molding. There shall be a front to back center support for all bases over 30” wide.

7. Horizontal parting rails between drawers shall be 3/4” particleboard with balanced surfaces, secured to and further reinforcing cabinet ends. When drawer stacks are keyed individually the parting rail shall run full depth of cabinet to prevent pilfer.

8. A 5mm diameter row hole pattern 32mm (1-1/4”) on center shall be bored in cabinet ends for adjustable shelves. This row hole pattern shall also serve for hardware mounting and replacement and/or relocation of cabinet components.

9. All door and drawer fronts and finished ends shall be balanced construction with “high-pressure” laminate bonded to both sides of a M-3, 47# particle board core.

10. Adjustable shelves shall be particleboard core, balanced surfaces and have a .020” thick PVC front edge matching the shelf.

    a. Adjustable shelves in cabinets over 36” wide shall be 1” thick.

    b. All adjustable shelves in open cabinets shall be 1” thick.

    c. All other shelves shall be 3/4” thick.

11. Fixed Interior Components such as fixed shelves, dividers, and cubicle compartments shall be full 3/4” thick particleboard attached with concealed interlocking mechanical fasteners.

12. All doors shall be a maximum of 24” wide.

D. Wall Cabinets:

1. All wall cabinet bottoms shall be of 1” thick particleboard core mechanically fastened to end panels and secured to the bottom back stretcher.

2. An upper 3/4“ thick stretcher shall be located behind the back panel. and secured to the cabinet top.

3. A lower 3/4” thick stretcher shall be located behind the back panel and attached to the end panels.

E. Base Cabinets:

1. All base cabinets, except sink cabinets, shall have a solid 3/4” thick sub-top fastened to the ends with interlocking mechanical fasteners.

2. All sink cabinets shall have a vertically mounted front stretcher panel supporting the countertop, a split removable back panel and four steel corner gussets used to secure the counter-top.

3. An upper 3/4” thick stretcher shall be located behind the back panel and attached to the end panels.

F. Tall Cabinets:

1. An intermediate fixed shelf shall be provided on all general storage cabinets to maintain internal dimensional stability under heavy loading conditions.

2. A 3/4” top and intermediate stretcher shall be located behind the back panels and attached to the end panels.

3. The intermediate stretcher is secured to the intermediate shelf, thus capturing the back panel.

G. Drawers:

1. Drawer box shall be constructed with a full 1/2” thick non-racking, non-deflecting platform bottom which is carried directly by “L” shaped, bottom mount drawer glides.

2. Sides, back, sub-front and bottom shall be 1/2” thick 47# density particleboard surfaced both faces with Light Beige, Greystone, or White thermally fused laminate per 2.02.B.1. The top edge shall be .020” PVC matching the drawer color.

3. Corners shall be joined with fluted wood dowels and glue, minimum 32mm o/c.

4. Drawer fronts shall be removable and attached drawer box sub-front with screws from inside of drawer.

5. Blum Metabox drawer systems are acceptable.

2.5 PERFORMANCE:

A. Laminates:

1. “High Pressure Laminates” shall meet the definition and performance requirements of NEMA LD3-1995. Vertical grade laminate shall be GP-28 balanced with a minimum grade of CL-20. Countertops shall be GP-50 or PF-42 as specified.

2. Thermally Fused Laminate shall meet the performance requirements of NEMA LD3-1995 for GP-28. Panel manufacturer shall provide published specification.

B. Adjustable Cabinet Shelving:

1. Shelving shall not deflect in excess of 1/4” when loaded as follows:

a. Standard Shelving - 25 pounds/sq. ft.

b. Library Shelving - 40 pounds/sq. ft.

2.6 COUNTERTOPS:

A. High-Pressure Decorative Laminate:

1. General Purpose, GP-50 or PF-42, high-pressure decorative laminate on horizontal surface and edges, conforming to NEMA Standard LD3-1995.

2. Laminate bonded to 1 1/8” thick 47# particleboard. Core shall be balanced with HPL backer.

3. All joints shall be secured with adhesive and tight joint fasteners.

4. Provide 4” high splashes as required.

5. Countertops shall conform to ANSI A161.2-1979 Performance Standards for Fabricated High-Pressure Decorative Laminate Countertops.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions under provisions of Section 01400.

B. Verify adequacy of backing and support framing.

C. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

A. Set and secure casework in place; rigid, plumb, and level.

1. The use of plastic or wood wall anchors and/or plugs is prohibited.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units and counter tops.

D. Carefully scribe casework and counter tops abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinet and counter bases to floor, and counter tops to base cabinets, using appropriate angles and anchorages.

F. Install backsplashes to wall surface and counter top. Apply bead of sealant to joints and run smooth.

G. Countersink anchorage devices at exposed locations. Conceal with plastic caps to match surrounding laminate; set tight to surrounding surfaces.

3.3 ADJUSTING

A. Adjust installed work under provisions of Section 01700.

B. Test installed work for rigidity and ability to support loads.

C. Adjust moving or operating parts to function smoothly and correctly.

3.4 CLEANING

A. Clean installed work under provisions of Section 01700.

B. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 13190

KENNEL EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section includes manufactured kennel equipment, canine kennel units, feline kennel units, and accessories.

B. Related Sections:

1. Division 1 – General Requirements.

1.2 SUBMITTALS

A. Section 01330 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory fittings, accessory listings, hardware location and schedule of finishes.

C. Product Data: Submit product data on components and accessories demonstrating compliance with specified requirements.

D. Samples: Submit two, 2 x 2 inches in size illustrating available colors and finishes for selection.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum years documented experience and approved by manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept delivery on site. Inspect for damage.

C. Store products in accordance with manufacturer’s recommendations. Protect units for damage during construction.

1.5 COORDINATION

A. Section 01039 - Administrative Requirements: Requirements for coordination.

B. Coordinate installation of units with mechanical trades installing ventilation duct where

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Mason Company; 260 Depot Street, Leesburg, OH 45135; Telephone 800/543-5567:

1. Substitutions: Not Permitted.

2.2 COMPONENTS

A. Galvanized Welded Wire Gates & Stall Front:

1. Gate frame and gate shall consist of 1” x 16 gauge (.065 inch wall) square HRPO ASTM A513 Tubing. Gate and frame shall be hot dip galvanized in accordance with ASTM A123, inside and out. Gate Grids shall be constructed of cold rolled steel wire 1/8 inch in diameter in the vertical direction with 15/16 inch spacing between wires, and cold rolled steel wire 1/4 inch in diameter in the horizontal direction with 3-7/16 inches or less spacing between wire. Horizontal and vertical wires shall be resistance welded at each junction. Each wire grid shall be inserted into the outer and internal 1” framework.

2. Hinges shall consist of two 3/8 inch diameter stainless steel hex head screws which shall be threaded into stainless steel tapped plugs inserted into the top and bottom of the door frame. Each plug shall contain a nylon pivot bushing for smooth precision rotation. Stainless steel two-way latch shall open both outward and inward. The latch shall secure automatically when gate is closed from the outward position and shall be designed to accept a padlock. The two-way latch bar, the latch catch, and the swing pendant shall be made from type 304 stainless steel.

B. Aluminum Framed FRP Isolation Panels:

1. Panels shall be constructed of an outer framework of 6063-T52 aluminum U-channel 3/4 x 3/4 x 1/8 inch thick. Internal braces shall be 6061-T6 aluminum H-channels 1-1/2 x 3/4 x 1/8 inch thick.

2. Bottom portion of isolation panel shall be 0.030 inch FRP bonded on each side of a 0.400 HDPE substrate. FRP panel shall be 48 inches high.

3. Upper portion of isolation panel shall be hot dip galvanized welded wire. Wire panels shall be welded at each junction and shall consist of 1/8 inch diameter vertical wires with 1-1/2 inch spacing between wires and 1/4 inch diameter horizontal wires with 4-1/4 inches spacing between wires. Wire panels shall be contained by means of a semi-rigid PVC extrusion inset into the aluminum framework.

4. Each Isolation panel shall be equipped with a Kenl-Dor.

C. Sani-Slope Aluminum Sloped Floor Mounting System:

1. Patented T-flange shall be mad eof solid extruded 6061-T6 aluminum. T-flange shall be 2-1/2 inches wide at its base and shall extend upward to a height of at least 3 inches. Patented isolation panel bottom rail extrusion shall be made of solid 6061-T6 extruded aluminum and shall be dimensioned to fit over the T-flange so that the isolation panel can be leveled and secured.

D. Kenl-Dor:

1. Large vertical sliding door shall be 1/4 inch thick, low-stress translucent polypropylene. Channels shall be solid extruded aluminum 6063-T6. Doors are raised and lowered by pulling or releasing a 3/16 inch clear vinyl coated stainless steel wire cable that is secured to the top of the door.

E. Rain-Tree Cat Condos – Caged Feline 109:

1. Cat Condo Quad Units with Litter Box Units with Portal Openings and Doors:

a. Rear, top, bottom and side panels shall be 3/4 inch fiber board that has a thermally fused melamine surface.

b. Doors and shelves shall be constructed of 3/4 inch PVC sheet that has a high pressure laminate surface bonded to it.

c. Door inserts shall be coated wire grid door mesh.

F. Rain-Tree Cat Condos – Feline Isolation 110 and Feline Quarantine 114:

1. Cat Condo Quad Units with Litter Box Units with Portal Openings and Doors:

a. Rear, top, bottom and side panels shall be 3/4 inch fiber board that has a thermally fused melamine surface.

b. Doors and shelves shall be constructed of 3/4 inch PVC sheet that has a high pressure laminate surface bonded to it.

c. Door inserts shall be tempered glass with air vents.

d. Integrated ventilation ductwork (ready for connection to external exhaust system by mechanical trades).

PART 3 EXECUTION

3.1 INSTALLATION

A. Assemble and install products in strict accordance with manufacturer's instruction.

3.2 ADJUSTING

A. Section 01700 - Execution Requirements: Requirements for starting and adjusting.

B. Adjust doors and operable parts for smooth operation.

END OF SECTION

SECTION 15010

GENERAL MECHANICAL AND PLUMBING REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This Division includes all labor, materials, equipment, tools, supervision, start-up services, Owner training, etc., including all incidental and related items, necessary to complete installation and successfully test and start up and operate the mechanical and plumbing systems indicated on the drawings, AND as described in each Section of Division 15 Specifications.

B. All drawings and General Provisions of the Contract, including the General Conditions, Supplementary General Conditions, and Division 1 specification sections, apply to work of all Division 15 sections. The items in this section are not intended to supersede, but are supplementary to, the requirements set forth in other Divisions of the specifications.

C. The Contractor, and his Subcontractors and Suppliers, shall include in his bid all materials, labor, and equipment involved, in accordance with all local customs, codes, rules, regulations; and secure compliance of all parts of the Specifications and Drawings regardless of Sectional inclusion in these Specifications.

1.02 DRAWINGS

A. The drawings are diagrammatic and show the general location and arrangement of equipment, piping, ductwork and related items. They shall be followed as closely as elements of the construction will permit.

B. The general mechanical and plumbing requirements are intended to augment the drawings and specifications. Should conflicts occur between the drawings and the specifications, the strictest provision shall govern. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the ARCHITECT and/or ENGINEER for resolution.

C. The CONTRACTOR shall examine the drawings of all other trades in order to verify the conditions governing the work on the job site. Arrange work accordingly, providing all ductwork, piping, fittings, traps, valves and accessories as may be required to meet such conditions.

D. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the ARCHITECT and/or ENGINEER.

E. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the ARCHITECT and/or ENGINEER for resolution.

1.03 COORDINATION OF WORK

A. The CONTRACTOR and his Subcontractors shall be responsible for all tasks applicable to their work in accordance with the Specifications, Drawings, and code requirements, and shall be responsible for coordinating locations and arrangements of their work to give best results with all other relevant trades.
   1. Coordinate his work to obtain symmetry in ceiling layouts, so that sprinkler heads, lights, diffusers, etc. are coordinated and are installed per the Architectural reflected ceiling plan.
   2. Coordinate all wall, roof, floor penetrations, equipment pads, etc. with architectural and structural trades.
   3. Refer to architectural floor plans for exact locations/heights of fixtures (standard and barrier

free), sinks, toilets, lavatories, water coolers, etc. Coordinate with architectural plans for details on casework, furniture, etc.

4. Verify requirements of all equipment with shop drawing submittals prior to installation - notify Architect/Engineer of any conflicts between shop drawings and plans.
5. Coordinate rough-in locations of mechanical control devices (i.e. thermostats, sensors, etc.) with electrical trades. T-stats shall be located @ 48" AFF unless noted otherwise.
6. Coordinate locations of mechanical items that require access (i.e. isolation valves, balance valves, balance dampers, fire dampers, damper actuators, valve actuators, exhaust fans, filters, etc.) with reflected ceiling plan. Items located above hard non-accessible ceilings shall be provided with access doors as required.
7. Do not route/locate below grade piping below, or with 45 degrees of the bottom corner of, foundation walls/footings. Coordinate with structural trades prior to installing piping.
8. Verify clearance requirements of all electrical and mechanical equipment/systems prior to the installation of any new work. Mechanical equipment, piping, ductwork, systems, etc. shall not interfere with electrical equipment spaces.

1.04 INSPECTION OF SITE AND PROJECT DOCUMENTATION

A. The CONTRACTOR shall visit the site and examine/verify the conditions under which the work must be conducted before submitting proposal. The CONTRACTOR shall examine the drawings and specifications of all other trades including Mechanical, Architectural, Structural and Electrical.

B. The submitting of a proposal implies that the CONTRACTOR has visited the site, examined all contract documents, and understands the conditions under which the work must be conducted.

C. The CONTRACTOR shall notify the ARCHITECT and/or ENGINEER, prior to submitting his bid via Request For Information (RFI), of any potential problems that he has identified during his inspection of the site or from the review of plans/specifications. RFIs must be submitted at least 5 working days prior to bid opening.

1.05 GENERAL SUPPORT REQUIREMENTS

A. Provide all necessary angle/brackets, hangers, or supplementary supporting steel as required for adequate support for all piping, ductwork, and equipment. Secure approval from Architect and/or Structural Engineer, in writing, before welding or bolting to steel framing or anchoring to concrete structure, or cutting/coring thru structural systems.

B. Where piping, ductwork, or equipment is supported or suspended from concrete construction, provide approved concrete inserts in formwork to receive hanger rods, such as Unistrut or Powerstrut, and where installed in metal deck, use Ramset or Welds as required.

C. Install plumbing and mechanical piping systems with adequate anchors, guides, expansion loops, etc. as required to provide for piping expansion/contraction.

1.06 GUARANTEE

A. CONTRACTOR shall guarantee that all labor, materials, and equipment are free from defects and agrees to replace or repair any part of this installation which becomes defective within a period of one year from the date of substantial completion following final acceptance. Acceptance date of substantial completion shall be as determined by the ARCHITECT and/or ENGINEER.

B. The CONTRACTOR shall file with the OWNER any and all guarantees from the equipment manufacturers including the operating conditions and performance capacities they are based on.

1.07 CODES, PERMITS AND FEES

A. Refer to Division 1, General Conditions and Supplementary Conditions.

B. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for mechanical work shall be secured and paid for by the CONTRACTOR.

C. All work shall be executed in accordance with the rules and regulations set forth in local and state

codes. Prepare any detailed drawings or diagrams which may be required by the governing authorities.

1. Mechanical and Plumbing systems shall be installed per current mechanical codes (Michigan Mechanical Code, Michigan Plumbing Code, International Fuel Gas Code, etc.), current NFPA codes (NFPA 101, NPFA 90, etc.), and applicable sections of the Michigan Building Code.

D. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern. In the event that the plans and specifications conflict with any rules, regulations, or codes applying, said rules, regulations and codes shall govern.

1.08 UTILITIES

A. Rules of local utility companies shall be complied with. The CONTRACTOR shall check with each utility company supplying service to the installation (i.e. water, gas, sewer, etc.) and coordinate service requirements including, but not limited to, all valves, meters, etc. which will be required The Contractor shall coordinate all utilities with the utility providers, the Owner shall pay or all required utility costs in his bid.

B. In the event that the plans and specifications conflict with any utility rules, regulations, or codes applying, said utility rules, regulations and codes shall govern.

1.09 SUBSTITUTION ITEMS REQUIRING PRIOR APPROVAL

A. All items that the CONTRACTOR proposes to use in the work that are not specifically named in the contract documents must be submitted for review. Such items must be submitted to the ARCHITECT and/or ENGINEER for approval a minimum of ten (10) days prior to bid opening. Requests for prior approval must be accompanied by complete catalog information, including but not limited to, model, size, accessories, complete electrical information and performance data in the form given in the equipment schedule on the drawings at stated design conditions. Where items are referred to by symbolic designations on the drawings, all requests for prior approval shall bear the same designations.

1.10 MATERIAL AND EQUIPMENT MANUFACTURERS

A. All items of equipment shall be furnished complete with all accessories normally supplied with the catalog items listed and all other accessories necessary for a complete and satisfactory operating system. All equipment and materials shall be new and shall be standard products of manufacturers regularly engaged in the production of plumbing, heating, ventilating and air conditioning equipment and shall be the manufacturer's latest design.

B. If an approved manufacturer is other than the manufacturer used as the basis for design, the equipment of product provided shall be equal in quality, durability, appearance, capacity and efficiency through all ranges of operation, shall conform with arrangements and space limitations of the equipment shown on the plans and/or specified, shall be compatible with the other components of the system and shall comply with the requirements for Substitution Items Requiring Prior Approval specified in this Section of the Specifications. All costs to make these items of equipment comply with these requirements including, but not limited to, piping, sheet metal, electrical work, and building alterations shall be included in the original bid.

C. All package unit skid mounted equipment that are factory assembled shall meet, in detail, the products named and specified within each section of the detailed Mechanical and Electrical Specifications.

1.11 OPERATION AND MAINTENANCE INSTRUCTIONAL MANUALS

A. Provide compete maintenance and operating instructional manuals covering all mechanical equipment as specified herein, Division 1 requirements, and individual equipment specification sections.

B. The O&M data shall be bound in a suitable number of 3" or 4", 3-ring, hard cover binders. Permanently imprinted on the cover shall be the words, "Manufacturer's Operation and Maintenance Data", project title, location of project, and the date. A table of contents shall be provided in the front of each binder.

C. Maintenance and operating instructional manuals shall be job specific to this project. Generic manuals are not acceptable. Each piece of equipment in the O&M manual shall be identified as identified on the project drawings (i.e. Furnace FUR-1, Domestic Water Heater DWH-1, Energy Recovery Ventilator ERV-1, etc.).

D. Internally subdivide the binder contents with permanent page dividers, organized by major equipment/systems (i.e. Furnaces, Plumbing Fixtures, Energy Recovery Ventilators, Plumbing Equipment, Temperature Controls, etc.)

E. Contents: Each volume of O&M manual shall have three parts:
   1. Part 1: A directory listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: O&M data arranged and subdivided by major equipment/systems. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers:
      a. List of equipment.
      b. Installation and operational procedures.
      c. Routine maintenance procedures.
      d. Trouble shooting procedures.
      e. Complete parts lists by nomenclature, manufacturer's part number and use.
      f. Recommended spare parts lists.
      g. Lubrication chart listing all types of lubricants to be used for each piece of equipment and the recommended frequency of lubrication.
      h. Complete wiring and schematic diagrams.
      i. Elevations and/or sections cut through all of the major equipment and sub-assemblies.
   3. Part 3: Project documents and certificates, including the following: Shop drawings.
      a. Shop drawings and product data.
      b. Testing, Adjusting, and Balance Reports (approved by Engineer).
      c. Warranty Certificates.
      d. Copies of approved construction permits.

F. Two (2) Maintenance and Operating manuals shall be provided to the ARCHITECT and/or ENGINEER for review when construction is 75% complete.

G. A minimum of two (2) copies of all approved Operation and Maintenance literature shall be furnished to the OWNER within 10 days after final inspection. O&M manuals must be completed prior to start of OWNER training as the manuals shall be used as the basis of the training.

1.12 SHOP DRAWINGS/SUBMITTALS

A. Refer to General Conditions and Supplementary General Conditions.

B. All shop drawings shall be submitted in groupings of similar and/or related items. Incomplete submittal groupings will be returned unchecked.

C. Submit fire protection system shop drawings, product data and hydraulic calculations to local authorities having jurisdiction, the OWNER'S insuring agency, and the ARCHITECT and/or ENGINEER for approval prior to fabrication or installation. Submit proof of approval to ARCHITECT and/or ENGINEER.

D. Submit six (6) copies of complete manufacturer's shop drawings for all equipment, valves, plumbing and heating specialties, refrigeration specialties, pipe hangers, wiring diagrams and control diagrams including, but not limited to the items listed below. Where items are referred to by symbolic designation on the drawings and specifications, all submittals shall bear the same designation. Refer to other Sections of the mechanical specifications for additional requirements.

1. Air Cooled Condensing units
2. Cabinet Unit Heaters
3. Coils
4. Ductwork Specialties
5. Electric Water Coolers
6. Energy Recovery Units
7. Fans
8. Gas Fired Furnaces
9. Grilles, Registers and Diffusers
10. Humidifiers
11. Makeup Air Units
12. Plumbing Specialties
13. Plumbing Equipment
14. Plumbing Fixtures
15. Pumps
16. Test and Balance Reports
17. Temperature Controls
18. Unit Heaters
19. Water Heaters

1.13 INSTRUCTION OF OWNER PERSONNEL

A. Before final inspection the CONTRACTOR shall instruct OWNER's designated personnel in operation, adjustment and maintenance of mechanical and plumbing equipment and systems at agreed upon times.
B. For equipment requiring seasonal operation, perform instructions for other seasons within six months.
C. Use Operation and Maintenance Manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
D. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

1.14 RECORD DRAWINGS

A. The CONTRACTOR shall keep accurate note of all deviations from the construction documents and discrepancies of construction on field drawings as they occur. The marked up field documents shall be available for review by the ARCHITECT and/or ENGINEER, and OWNER at their request.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 INSTALLATION OF EQUIPMENT

A. Install equipment in strict accordance with all directions and recommendations furnished by the manufacturer. Where such directions are in conflict with the drawings and specifications, report such conflicts to the ARCHITECT and/or ENGINEER for resolution prior to installation.

3.02 WORK INVOLVING OTHER TRADES

A. Certain items of equipment or materials specified in the Mechanical Division may have to be installed by other trades due to code requirements or union jurisdictional requirements. In such instances, the Contractor shall complete the work through an approved, qualified subcontractor and shall include the full cost for same in his bid.

3.03 LUBRICATION

A. Provide all lubrication for the operation of the mechanical equipment until acceptance by the OWNER. CONTRACTOR shall be responsible for all damage to bearings up to the date of

acceptance of the equipment. Protect all bearings and shafts during installation. Thoroughly grease steel shafts to prevent corrosion. Provide covers as required for proper protection of all motors and other equipment during construction.

3.04 COORDINATION

A. Install work to avoid interference with work of other trades including, but not limited to, architectural and electrical trades. Remove and relocate any work that causes an interference at CONTRACTOR's expense. Disputes regarding the cause of an interference shall be resolved by the ARCHITECT and/or ENGINEER.

3.05 CHASE, SHAFTS AND RECESSES

A. Coordinate with structural, architectural and other trades to ensure accurate location and size of chases, shafts and recesses.

3.06 SLEEVES

A. Provide and install Schedule 40 black steel pipe sleeves, cut to length, wherever pipes pass through above grade walls and floors. Provide and install galvanized steel pipe sleeves, cut to length, wherever pipes pass through below grade foundation walls and slab on grade floors. Sleeves shall terminate flush with walls in finished areas. All sleeves through the floor are to extend two (2) inches above finish floor.

B. Provide escutcheons at each penetration through walls, floors, and ceilings in exposed areas.

C. Patch sleeves to match building material.

3.07 SEALING OF MECHANICAL OPENINGS

A. Seal the space around pipes in sleeves and around duct openings through walls, floors and ceilings.

B. Provide adequate clearance to allow for proper duct/pipe movement and sealing.

C. Provide/install fireproof wall and floor sleeves as required by applicable building codes at all applicable wall, ceiling, and floor penetrations. Refer to Architectural plans for wall assembly ratings.

D. Sleeves placed in floors shall be flush with the underside of the floor construction and shall have planed, square ends, extending 2 inches above the finished floor, unless otherwise noted or detailed.

E. Where sleeves pass through reinforced concrete floors, they shall be properly set in position prior to concrete pouring in such a way that they will be maintained in position until the concrete is set.

F. Ducts and pipes passing through below grade perimeter walls or slabs on grade shall have the space between the duct/pipe and sleeve sealed watertight with a mechanically expandable elastomer seal device.

G. Penetrations through fire rated floors and walls shall be firestopped in accordance with applicable building codes with UL and FMRC approved materials and shall have a fire rating equal to or greater than the fire partition rating. Refer to architectural plans for locations and assembly ratings.
   1. Packing: Refractory fiber or ceramic fiber.
      a. Manufacturers:
         1) Carborundum Fiberfrax.
         2) Johns-Manville - Cerafelt.
         3) Eagle Picher Epitherm 1200.
         4) Babcock and Wilcox Kaowool.
   2. Fire stop sealant.
      a. Manufacturers:

1) Hilti
2) Tremco
3) Mameco
4) Pecora

3. For polypropylene (Acid Waste/Acid Vent piping) penetrations through fire rated assemblies, provide an intumescent firestop.
   a. Hilti CP 642 Firestop Collar.
   b. Hilti FS-ONE High Performance Intumescent Firestop Sealant.
   c. 3M Fire Barrier PPD Plastic Pipe Device.
   d. 3M Fire Barrier Intumescent Firestop Sealant.
4. Where combustible pipes, tubes, vents, etc. penetrate a fire rated assembly, such penetrations shall be protected by an approved through-penetration fire stop collar/sealant system per the building code.
   a. Through -penetration firestop systems shall be tested in accordance with ASTM E814 with a minimum positive pressure differential of 0.01 inch WG. Through penetration firestop systems shall have a "F" rating and a "T" rating of not less than 1 hour but not less than the required rating of the assembly penetrated.
   b. Hilti CP 642 Firestop Collar.
   c. Hilti FS-ONE High Performance Intumescent Firestop Sealant.
   d. 3M Fire Barrier PPD Plastic Pipe Device.
   e. 3M Fire Barrier Intumescent Firestop Sealant.

3.08 CUTTING, CORING AND PATCHING

A. Refer to General Conditions

B. All cutting, coring, patching and repair work shall be performed by the CONTRACTOR through approved, qualified Subcontractors. Patching and repair work shall match new or existing conditions. CONTRACTOR shall include full cost of same in his bid.

3.09 EXCAVATION AND BACKFILLING

A. Provide all excavation, trenching, tunneling and backfilling required for the mechanical work.

B. Provide all pumping and/or well pointing required for the mechanical work.

C. Provide foundations if required to support underground piping.

D. Refer to Architectural/Structural specification sections for excavation and backfilling details.

3.10 EQUIPMENT FOUNDATIONS AND SUPPORTS

A. Shall be as required or as shown on plans or specified.

B. Provide concrete housekeeping pads or blocks for all floor mounted mechanical equipment (i.e. furnaces, water heaters, well tanks, ERVs, etc.). Concrete housekeeping pads shall be installed by qualified concrete trade subcontractors. Concrete housekeeping pads shall be poured before equipment is installed, minimum 4" tall.

C. For equipment suspended from ceiling or walls, furnish and install all inserts, rods, structural steel frames, brackets and platforms required. Obtain approval of STRUCTURAL ENGINEER for same including loads, locations, and methods of attachment.

3.11 EQUIPMENT CONNECTIONS

A. Make connections to equipment, fixtures and other items included in the work in accordance with the approved shop drawings and rough-in measurements furnished by the manufactures of the particular equipment furnished.

B. All piping connections to equipment shall be flanged or shall be made with unions to facilitate equipment removal.

C. All piping connections to pumps, coils, and other equipment shall be installed without strain at the pipe connection of this equipment.

D. Brass unions for connections of 2 inch and less and flanged union with dielectric gasket and bolt sleeves for 2-1/2 inch and greater shall be used for equipment connections of dissimilar metals.

E. All ductwork connections to air handling equipment shall be made with flexible duct connectors.

3.12 ACCESS DOORS

A. The CONTRACTOR, and/or his Subcontractors, shall provide access doors for access to any of their respective mechanical equipment (i.e. valves, controls, coils, motors, air vents, filters, equipment, etc.) that is installed in inaccessible areas. Provide access doors in the walls, as required to make all electrical boxes, controls and other equipment installed by the CONTRACTOR accessible. In the walls, provide Milcor No. "DW" or "M" as required to make all equipment installed by the CONTRACTOR accessible. Minimum size 12 inches x 12 inches. In the ceiling, provide Milcor N. 3210, 3105 or 3206 for accessibility as mentioned above, 24 inches x 24 inches minimum size. The plaster or acoustical tile insert shall be by the architectural trades. Areas with accessible ceilings (ceilings where tiles are not fastened in place and can be individually removed without removal of adjacent tiles) will not require access doors.

B. Refer to Architectural specifications for manufacturer's and model numbers and additional information.

C. The CONTRACTOR, and/or his Subcontractors, shall be responsible for quantities of access doors and shall receive approval for locations from the ARCHITECT and/or ENGINEER prior to installation.

D. The CONTRACTOR, and/or his Subcontractors, shall purchase appropriate access doors, coordinate locations, and shall pay for installation by a qualified architectural subcontractor.

E. When access doors are in fire resistant walls or ceilings, they must bear the Underwriters' Laboratories, Inc., Label, with time design rating equal to or exceeding that of the wall or ceiling unless they were a part of the tested assembly.

3.13 CLEANING

A. Each mechanical trade shall be responsible for removing all debris daily as required to maintain the work area in a neat, orderly condition.

B. After equipment, ductwork, and piping systems have been completed and tested, each entire system shall be cleaned and flushed.

3.14 PAINTING

A. All mechanical systems, equipment, piping, ductwork, etc. exposed in finished areas shall be painted to match the surrounding finishes. Refer to specification section 09900 - Coordinate color with Architect.

3.15 PROTECTION AND HANDLING OF EQUIPMENT AND MATERIALS

A. Electrical equipment furnished by Mechanical Trades and installed by Electrical Trades shall be turned over to Electrical Trades in good condition.

B. Equipment and materials shall be protected from theft, injury or damage.

C. Materials with enamel or glaze surface, shall be protected from damage by covering and/or coating as recommended in bulletin, "Handling and Care of Enameled Cast Iron Plumbing Fixtures," issued by the Plumbing Fixtures Manufacturers Association, and as approved.

D. Coat polished or plated metal parts with white petroleum jelly immediately after installation.

E. Protect equipment outlets, pipe and duct openings with temporary plugs or caps.

F. Provide adequate storage for all equipment and materials delivered to the job site. Equipment set in place in unprotected areas must be provided with temporary protection.

3.16 FILTERS

A. Provide and maintain filters in air handling systems throughout the construction period and prior to final acceptance of the building. Do not run air handling equipment without all prefilters and final filters as specified.

B. Immediately prior to final building acceptance by the OWNER, the CONTRACTOR shall:
   1. Thoroughly wash, recharge and reinstall cleanable type air filters.
   2. Replace all disposable type air filters, prefilters and final filters, with new units. In addition to replacing the filters with new ones, the contractor shall supply the Owner with an extra set of each filter for the Owner's use.

3.17 GENERAL SUPPORT REQUIREMENTS

A. Each mechanical trade shall provide all required supporting components to properly support their work. Supporting components/systems shall be in accordance with Code and as specified.

B. Provide all necessary angle/brackets or supplementary steel as required for adequate support for all piping, ductwork, specialties, and equipment. Secure approval form ARCHITECT and/or STURCTURAL ENGINEER, in writing, before welding or bolting to steel framing or anchoring to concrete structure.

C. Where piping, ductwork, specialties, or equipment is supported or suspended from concrete construction, provide approved concrete inserts in formwork to receive hanger rods, such as Unistrut or Powerstrut, and where installed in metal deck, use Ramset or Welds as required.

3.18 PIPING INSTALLATION IN PLENUM SPACES

A. Pipe and pipe fittings installed in mechanical air plenum spaces shall of non-combustible materials. If PVC piping is specified as an approved material, it shall be wrapped with at least 1.5 inches of non-combustible insulation plus continuous vapor barrier which meet building code required smoke and flame spread ratings.

B. Coordinate location of mechanical plenum spaces with electrical trades for plenum rated cable requirements.

3.19 DRAWINGS AND MEASUREMENTS

A. These specifications and accompanying drawings are intended to describe and provide for finished work. They are intended to be cooperative, and what is called for by either the drawings or specifications shall be as binding as if call for by both. The work herein described shall be complete in every detail.

B. The Drawings are not intended to be scaled for rough-in measurements, nor to serve as Shop Drawings. Field measurements necessary for ordering materials and fitting the installation to the building construction and arrangement shall be taken by the Contractor. The Contractor shall check latest architectural drawings to locate equipment/fixtures/etc., check latest structural drawings for interferences, etc..

3.20 PIPING SYSTEMS TESTING

A. Test drainage piping systems in accordance with their respective and applicable governing codes. Test drainage and waste piping hydraulically by filling the system to its highest point or at a static head of 10 feet, whichever is higher.

B. Pressure test pluming piping (domestic cold water, domestic hot water, hot water recirculation, etc.) in accordance with governing and applicable codes. At minimum, test with water at 225 PSIG - permissible pressure drop shall be 0 PSIG over 2 hour period.

C. Pressure test natural gas and propane gas piping in accordance with governing and applicable codes. At minimum, test with air at 100 PSIG - permissible pressure drop shall be 0 PSIG over 2 hour period.

3.21 EXTRA WORK

A. For any extra work which may be proposed, the Contractor shall furnish to the General Contractor/Construction Manager, an itemized breakdown of the estimated cost of all materials and labor required to complete this work. The estimate cost breakdown shall include unit prices (same prices for increase/decrease of work) for all materials (i.e. duct, piping, valves, equipment, equipment rental, etc.) and all labor (i.e. manhours, overtime, etc.) which may be required for any proposed extra work. The Contractor shall not proceed until receiving a written order from the General Contractor establishing the agreed price and describing the work to be done.

3.22 ACCEPTANCE PROCEDURE

A. Upon successful completion of start-up and recalibration, but prior to building acceptance, substantial completion and commencement of warranties, the ARCHITECT and/or ENGINEER shall be requested in writing to inspect the satisfactory operation of all mechanical control systems.

B. The CONTRACTOR shall demonstrate operation of equipment and control systems, including each individual component, to the ARCHITECT and/or ENGINEER and OWNER.

C. After correcting all items appearing on the punch list, make a second written request to the ARCHITECT and/or ENGINEER for inspection and approval.

D. After all items on the punch list are corrected and formal approval of the mechanical systems is provided by the ARCHITECT and/or ENGINEER, the CONTRACTOR shall indicate to the OWNER in writing the commencement of the warranty period.

E. If testing, adjusting, and balancing of a mechanical system cannot take place due to seasonal weather, all parties involved (i.e. mechanical contractor and test/balance agency, and manufacturer's representative) shall return to the site during season required to properly test, adjust and balance the equipment. An example of this would be a heating system installed and tested in the cooling season (summer). Due to the fact that there may not be enough heating load required to properly test the boiler, all parties shall return to the site the following heating season (winter) to test, adjust, and balance the heating system.

F. Operation of the following systems shall be demonstrated:
   1. Air Handling Systems
   2. Refrigeration Systems
   3. Heating Systems
   4. Energy Recovery Systems
   5. Space Temperature Controls

END OF SECTION

SECTION 15075

MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe Markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers.

B. ASTM D 709 - Standard Specification for Laminated Thermosetting Materials.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Automatic Controls: Tags. Key to control schematic.

C. Control Panels: Nameplates.

D. Ductwork: Plastic Tape Duct Markers.

E. Heat Transfer Equipment: Nameplates.

F. Instrumentation: Tags.

G. Major Control Components: Nameplates.

H. Piping: Pipe markers.

I. Small-sized Equipment: Tags.

J. Thermostats: Nameplates.

2.02 MANUFACTURERS

A. Brady Corp.

B. Champion-America, Inc.

C. Seton Identification Products.

2.03 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: Conform to ANSI/ASME A13.1, unless specified otherwise.
   2. Letter Height: 1/2 to 1 inch to suit the size of equipment being labeled.
   3. Background Color: Conform to ANSI/ASME A13.1, unless specified otherwise.
   4. Plastic: Conform to ASTM D 709.

2.04 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

2.05 PIPE MARKERS

A. Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.06 DUCT MARKERS

A. Plastic Tape Duct Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

F. Identify air handling units, fans, pumps, furnaces, ERVs, water heaters, water treatment devices, etc. with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

G. Identify control panels and major control components outside panels with plastic nameplates.

H. Identify thermostats relating to terminal boxes or valves with nameplates.

I. Identify air terminal units and radiator valves with numbered tags.

J. Tag automatic controls, instruments, and relays. Key to control schematic.

K. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and unique pressure or temperature if necessary to distinguish between other systems. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction. Arrows and markers shall be mounted to provide unobstructed visibility from floor level.

L. Identify ductwork (i.e. Supply Air, Return Air, Outdoor Air, Fresh Air, Exhaust Air, etc.) with plastic

tape duct markers. Identify with air handling unit identification number and area served. Locate identification on ductwork at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction, at each riser, and at straight runs not to exceed 20' apart.

M. Paint exposed piping per specification section 09900.

END OF SECTION

SECTION 15082

PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.

B. ASTM C 195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.

C. ASTM C 449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

D. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

E. ASTM C 533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.

F. ASTM C 534/C 534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

G. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation.

H. ASTM C 795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

I. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

J. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials.

K. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association.

L. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc..

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than 10 years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 10 years of experience.

C. Where insulation and covering is specified or required to include a vapor barrier, it is critical that the integrity of the vapor barrier is maintained. Do not use fasteners that may unintentionally penetrate the vapor barrier. Where fasteners must penetrate the vapor barrier, the vapor barrier shall be repaired with a patch or tape of the same material.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

B. Store insulation in original wrapping and protect from weather, dirt, chemicals, and damage.

1.05 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

B. Where insulation and covering is specified or required to include a vapor barrier, it is critical that the integrity of the vapor barrier is continuously maintained. Fasteners or other securing devices that may unintentionally penetrate, or damage, the vapor barrier are prohibited. Where fasteners must penetrate the vapor barrier, the vapor barrier shall be repaired.

2.02 GLASS FIBER

A. Manufacturers:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation: www.certainteed.com.

B. Insulation: ASTM C 547 and ASTM C 795; rigid molded, noncombustible.
   1. 'K' value: ASTM C 177, 0.24 at 75 degrees F.
   2. Maximum service temperature: 850 degrees F.
   3. Maximum moisture absorption: 0.2 percent by volume.
   4. Density: 3.5 lb./cu. ft.

C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96 of 0.02 perm-inches. Secure with self-sealing longitudinal laps and butt strips.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive:
   1. Compatible with insulation as recommended by insulation manufacturer.

F. Insulating Cement/Mastic:
   1. ASTM C 195; hydraulic setting on mineral wool.

G. Fibrous Glass Fabric:
   1. Cloth: Untreated; 9 oz./sq. yd. weight.
   2. Blanket: 1.0 lb./cu. ft. density.

H. Indoor Vapor Barrier Finish:
   1. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.03 HYDROUS CALCIUM SILICATE

A. Manufacturers:
   1. Johns Manville Corporation; Model Thermo-12/Blue: www.jm.com.
   2. Owens-Corning; Model Kaylo Pink:
   3. Pablo Div., Fiberboard Corp.; Model Super Caltemp Gold: www.jm.com.

B. Insulation: ASTM C 533 and ASTM C 795; rigid molded, asbestos free, gold color.
   1. 'K' value: ASTM C 177 and C518; 0.44 at 300 degrees F, when tested in accordance with ASTM C 177 or ASTM C 518.
   2. Maximum service temperature: 1200 degrees F.
   3. Density: 15 lb./cu ft.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D. Insulating Cement:
   1. ASTM C 449/C 449M.

2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION (CELLULAR FOAM)

A. Manufacturer:
   1. Armacell International: www.armacell.com.
   2. Armstrong "AP Armaflex".
   3. Rubatex Corp.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C 534 Grade 3; use molded tubular material wherever possible. Insulation shall not be used on stainless steel.
   1. K Value: ASTM C177 or C518; 0.27 at 75 degrees F.
   2. Minimum Service Temperature: -40 degrees F.
   3. Maximum Service Temperature: 220 degrees F.
   4. Maximum Service Absorption: ASTM D1056; 1.0 percent (pipe) by volume, 1.0 percent (sheet) by volume.
   5. Maximum Vapor Transmission: ASTM E96; 0.20 perm inches.
   6. Maximum Flame Spread: ASTM E84; 25.
   7. Maximum Smoke Developed: ASTM E84; 50.
   8. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.05 JACKETS

A. PVC Plastic.
   1. Manufacturers:
      a. Johns Manville Corporation: www.jm.com.
      b. Knauf.
      c. Ceel-Co.
      d. Certain Teed.
   2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E 96/E 96M.
      d. Maximum Flame Spread: ASTM E84; 25.
      e. Maximum Smoke Developed: ASTM E84; 50.
      f. Thickness: 15 mil.
      g. Connections: Pressure sensitive color matching vinyl tape.
      h. Jacket shall be ultraviolet-resistant.
      i. Jackets shall meet USDA and FDA requirements where applicable.
   3. Covering Adhesive Mastic: Compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

C. Equipment nameplates, identification tags, etc. shall not be covered by insulation.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations. Install PVC jackets and fitting covers for all piping not concealed in walls or above ceilings – Mechanical Rooms, Kennel Areas, Storage Rooms, etc.

C. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic. Vapor barrier shall be continuous.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
   3. Provide calcium silicate inserts or other heavy density insulating material suitable as approved by the Engineer for the planned temperature range, where pipes pass through walls, sleeves, pipe hangers/rollers, and other pipe penetrations.
   4. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints. Bevel and seal ends of insulation. Provide removable insulation access sections to permit access and removal of unions, flanges, and strainer baskets. Access sections shall be capable of removal and replacement with no damage to adjacent insulation.

D. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
   3. Finish with tape and white paintable vapor barrier jacket.
   4. Provide calcium silicate inserts or other heavy density insulating material suitable as approved by the Engineer for the planned temperature range, where pipes pass through walls, sleeves, pipe hangers/rollers, and other pipe penetrations.
   5. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints. Bevel and seal ends of insulation.

E. Provide removable insulation covers for providing access/removal of unions, flanges, strainer baskets, etc.. Access sections shall be capable of removal and replacement with no damage to adjacent insulation.

F. Inserts and Shields:
   1. Insert Application: All domestic hot water piping and all other piping 1 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts. All piping, all sizes, shall have shields installed between the pipe hangers and insulation or inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert material: Hydrous calcium silicate insulation (or other heavy density insulating material, as approved by the Engineer, for the planned temperature range).

G. Continue insulation through walls, sleeves, pipe hangers/rollers, and other pipe penetrations. Install steel sleeves at all wall and floor penetrations. Finish at supports, protrusions, and interruptions. At fire separations, fire caulk per building code requirements.

H. Pipe Exposed in Mechanical Equipment Rooms, Kennel Areas, Storage Rooms, or any other Finished Spaces: Finish with PVC jacket and fitting covers.

I. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

J. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with PVC jacket with seams located on bottom side of horizontal piping.

K. Ends of insulation shall be sealed off. Spray paint is not acceptable. No exposed ends.

L. Insulation not properly installed shall be removed and replaced or repaired as necessary.

M. Insulation on hot surfaces shall be applied while the surfaces are hot to avoid breaking of insulation during expansion of piping.

3.03 SCHEDULES

A. Plumbing Systems:
   1. Domestic Hot Water Supply:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: 2 inch and smaller.
            (a) Thickness: 1.0 inch.
         2) Pipe Size Range: 2-1/2 inch and larger.
            (a) Thickness: 1.5 inch.
   2. Domestic Hot Water Recirculation:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: 2 inch and smaller.
            (a) Thickness: 1 inch.
         2) Pipe Size Range: 2-1/2 inch and larger.
            (a) Thickness: 1.5 inch.
   3. Domestic Cold Water:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: All sizes.
            (a) Thickness: 1.0 inch.
   4. Plumbing Vents (metal piping only) Within 10 Feet of the Exterior:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: 1-1/4 inch and larger.
            (a) Thickness: 0.5 inch.
      b. Cellular Foam Insulation:
         1) Pipe Size Range: 1-1/4 inch and larger.
            (a) Thickness: 0.5 inch.

B. Cooling Systems:
   1. Cold Condensate Drains:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: All sizes.
            (a) Thickness: 1 inch.
      b. Cellular Foam Insulation:
         1) Pipe Size Range: All sizes.
            (a) Thickness: 1 inch.
   2. Refrigerant Suction:
      a. Cellular Foam Insulation:
         1) Pipe Size Range: All sizes.
            (a) Thickness: 1 inch.
   3. Refrigerant Hot Gas:
      a. Cellular Foam Insulation:
         1) Pipe Size Range: All sizes.
            (a) Thickness: 1 inch.

END OF SECTION

SECTION 15083

PIPING SAFETY COVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping Safety Covers.

B. Lavatory Piping Enclosure.

C. Basin/Sink Piping Enclosure.

1.02 REFERENCES

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council.

B. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

C. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

D. ASTM D 2240 - Standard Test Method for Rubber Property--Durometer Hardness.

1.03 SUBMITTALS

A. Product Data: Manufacturer's descriptive literature for products specified in this section.

B. Shop Drawings: Indicate locations and configurations of piping insulation for indicated plumbing configurations.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products of this section in manufacturer's unopened packaging until installation; maintain storage conditions for products in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Truebro, Inc.; 7 Main Street, P.O. Box 440, Ellington, CT 06029. ASD. Tel: (800) 340-5969 (outside CT), (860) 875-2868 (inside CT). Fax: (860) 872-0300. Email: info@truebro.com. www.truebro.com.

B. McGuire Manufacturing.

2.02 PIPING INSULATION ACCESSORIES

A. Provide products that comply with the following:
   1. Americans With Disabilities Act (ADA), Article 4.19.4.
   2. ANSI/ICC A117.1, American National Standard for Accessible Buildings and Facilities.
   3. BOCA Basic Building Code.
   4. Requirements of applicable building code.

B. Piping Safety Covers: Truebro Lav-Guard.
   1. Characteristics: Three-piece molded assembly, minimum 1/8 inch wall thickness, with internal ribs to provide air space between piping and piping insulation jacket, molded to receive manufacturer's snap-clip fasteners.
   2. Vinyl Material: Impact-resistant and stain-resistant molded closed-cell anti-microbial vinyl compound, UV-stable, non-fading, non-yellowing; having the following performance

characteristics:
a. Burning Characteristics: 0 seconds Average Time of Burning (ATB), 0 mm Area of Burning (AEB), when tested in accordance with ASTM D 635.
b. Thermal Conductivity: K-value 1.17, when tested in accordance with ASTM C 177.
c. Indentation Hardness: 60, minimum, when tested in accordance with ASTM D 2240, using Type A durometer.

3. Trap Assembly Cover: Three-piece assembly, with removable clean-out nut enclosure.
4. Angle Stop Covers: Formed with hinged cap for access to valve without requiring cover removal.
5. Configurations: In accordance with manufacturer's product data for project piping configurations indicated on drawings.
6. Color: China White, gloss finish; paintable.
7. Fasteners: Manufacturer's standard re-usable snap-clip fasteners; wire-tie fasteners not permitted.

C. Lavatory Piping Enclosure: Truebro Lav-Shield.
1. Characteristics: One-piece rigid molded vinyl enclosure, minimum 1/8 inch wall thickness, factory-punched for manufacturer's wall fasteners.
2. Vinyl Material: Impact-resistant and stain-resistant molded closed-cell vinyl, having the following performance characteristics:
a. Burning Characteristics: 0 seconds Average Time of Burning (ATB), 0 mm Area of Burning (AEB), when tested in accordance with ASTM D 635.
b. Indentation Hardness: 69, minimum, when tested in accordance with ASTM D 2240, using Type A durometer.
3. Vinyl Color: China White, fine-textured finish; paintable.
4. Fasteners: Manufacturer's standard stainless steel wall fasteners with tamper-resistant heads.

D. Basin/Sink Piping Enclosure: Truebro Basin Guard.
1. Characteristics: One-piece rigid molded vinyl enclosure, minimum 0.093 inch wall thickness, factory-molded flanges for fasteners.
2. Vinyl Material: Impact-resistant and stain-resistant molded closed-cell vinyl, having the following performance characteristics:
a. Burning characteristics, when tested in accordance with ASTM D 635: 0 seconds Average Time of Burning (ATB), 0 mm Area of Burning (AEB).
b. Indentation Hardness: 69, minimum, when tested in accordance with ASTM D 2240, using Type A durometer.
3. Width: 36 inches.
4. Color: White, fine-textured finish; paintable.
5. Fasteners: Supply non-corroding fasteners with tamper-resistant heads; type recommended by manufacturer for indicated project conditions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping configurations are correct type for piping cover component configurations specified.

3.02 INSTALLATION

A. Install products of this section in accordance with manufacturer's printed installation instructions.

B. Install "Lav-Shields" below wall mounted lavatories/sinks to completely conceal exposed piping/traps/mixing valves/etc.

C. Install "Lav-Guards" below counter mounted lavatories/sinks to cover exposed piping/traps.

3.03 PROTECTION OF INSTALLED PRODUCTS

A. Do not allow damage to installed products by subsequent construction activities; protect products until Substantial Completion.

END OF SECTION

SECTION 15086

DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct Liner.

1.02 REFERENCE STANDARDS

A. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

B. ASTM C 553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

C. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

D. ASTM C 1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).

E. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

F. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials.

G. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association.

H. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc..

1.03 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than 10 years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 10 years of experience and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics,

and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

B. Where insulation and covering is specified or required to include a vapor barrier, it is critical that the integrity of the vapor barrier is continuously maintained. Fasteners or other securing devices that may unintentionally penetrate, or damage, the vapor barrier are prohibited. Where fasteners must penetrate the vapor barrier, the vapor barrier shall be repaired.

2.02 GLASS FIBER, FLEXIBLE (EXTERIOR DUCT WRAP)

A. Manufacturer:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation: www.certainteed.com.

B. Insulation: ASTM C 553; flexible, noncombustible blanket.
   1. 'K' value: 0.29 at 75 degrees F, when tested in accordance with ASTM C 518.
   2. Maximum Service Temperature: 450 degrees F.
   3. Maximum Water Vapor Sorption: 5.0 percent by weight.
   4. Maximum Density: 1.5 lb./cu ft.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.058 ng/Pa s m (0.04 perm inch), when tested in accordance with ASTM E 96/E 96M.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive. The use of duct tape is prohibited.

2.03 GLASS FIBER, RIGID (EXTERIOR BOARD DUCT INSULATION)

A. Manufacturer:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation: www.certainteed.com.

B. Insulation: ASTM C 612; rigid, noncombustible blanket.
   1. 'K' value: 0.31 at 75 degrees F, when tested in accordance with ASTM C 518.
   2. Maximum service temperature: 450 degrees F.
   3. Maximum Water Vapor Sorption: 5.0 percent.
   4. Maximum Density: 3.0 lb./cu ft.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.058 ng/Pa s m (0.04 perm inch), when tested in accordance with ASTM E 96/E 96M.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure

sensitive rubber based adhesive. The use of duct tape is prohibited.

E. Indoor Vapor Barrier Finish:
   1. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.04 DUCT LINER (Elestomeric)

A. Manufacturers:
   1. Armacell; Model AP/Armaflex SA Duct Liner: www.armacell.com.

B. Insulation: Flexible, closed-cell elastomeric insulation, witch self-adhering backing, in sheet form. The product shall meet the requirements as defined in ASTM C 534, Grade 1, Type 2, specification for preformed elastomeric cellular thermal insulation in sheet and tubular form.
   1. Apparent Thermal Conductivity: Maximum of ASTM C 518, 0.27 at 75 degrees F.
   2. Water Absorption, % by volume: 0.2% (ASTM C 209).
   3. Water Vapor Permeability: Less than 0.08 Perm-inch (ASTM E 96, Procedure A).
   4. Flame Spread/Smoke Developed: 25/50 (ASTM E 84).
   5. Microbial Growth: UL 181 (Mold Growth), ASTM G 21 (Fungal), ASTM G 22 (Bacterial).
   6. Service Temperature: Up to 180 degrees F. Down to -297degrees F.
   7. Rated Velocity on Coated Air Side for Air Erosion: 4,000 fpm, minimum.
   8. Density: 3.0 - 6.0 lb./ft. (ASTM D1622).
   9. Minimum Noise Reduction Coefficients (ASTM C 423):
      a. 3/4 inch Thickness: 0.30.
      b. 1 inch Thickness: 0.30.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air below ambient temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated ducts conveying air above ambient temperature:
   1. Provide with standard vapor barrier jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
   3. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

E. External Duct Insulation Application:
   1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
   2. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
   3. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
   4. Stop and point insulation around access doors and damper operators to allow operation

without disturbing wrapping.

5. Continue insulation through wall penetrations using rigid fiberglass insulation 6 inches on either side of wall.

F. Duct and Plenum Liner Application:
   1. Adhere insulation with adhesive for 100 percent coverage. All exposed edges of duct liner shall be coated with the same adhesive. All rips and tears shall be repaired using adhesive. Severely damaged areas of duct liner and duct liner which has been wetted shall be replaced entirely.
   2. Seal and smooth joints. Seal and coat transverse joints.
   3. All internal duct areas shall be covered with duct liner. Traverse joints shall be firmly butted with no gaps, and coated with adhesive. Longitudinal corner joints shall be overlapped and compressed.
   4. Metal nosing shall be applied to all upstream transverse edges to additionally secure the insulation.
   5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.
   6. Note that ducts lined with duct liner are not required to have external duct insulation, except for ducts in unconditioned attics or crawl spaces which shall be provided with exterior insulation specified.

3.03 SCHEDULES

A. Exhaust and Relief Air Ducts Within 10 ft. of Exterior Openings:
   1. Flexible Glass Fiber Duct Insulation: 1.5 inches thick.
   2. Rigid Glass Fiber Duct Insulation: 1.5 inches thick.

B. Outside Air Intake Ducts:
   1. Flexible Glass Fiber Duct Insulation: 3 inches thick.

C. Plenums:
   1. Rigid Glass Fiber Duct Insulation: 3 inches thick.

D. Supply Air Ducts and Fresh Air:
   1. Flexible Glass Fiber Duct Insulation: 1.5 inches thick.
   2. Rigid Glass Fiber Duct Insulation: 1.5 inches thick.

E. Ductwork passing through walls (6 inches on either side of wall):
   1. Rigid Glass Fiber Duct Insulation: 1.5 inches thick.

F. All Ductwork (i.e. supply air, return air, exhaust air, etc.) Within 25 ft. of Mechanical Equipment (i.e. Furnaces):
   1. Elastomeric Duct Liner: 1.5 inches thick.
   2. Note that ducts lined with duct liner are not required to have external duct insulation, except for ducts in unconditioned attics or crawl spaces which shall be provided with exterior insulation specified.

G. Ducts Exposed to Outdoors or Outdoor Air Temperatures (i.e. Outdoors, Attics, Soffits, or Crawlspaces):
   1. Flexible Glass Fiber Duct Insulation: 4 inches thick.
   2. Rigid Glass Fiber Duct Insulation: 4 inches thick.

END OF SECTION

SECTION 15128

GAGES AND METERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure gages and pressure gage taps.

B. Thermometers and thermometer wells.

1.02 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers.

B. ASTM E 1 - Standard Specification for ASTM Liquid-in-Glass Thermometers.

C. ASTM E 77 - Standard Test Method for Inspection and Verification of Thermometers.

D. AWWA C701 - Cold Water Meters -- Turbine Type, for Customer Service; American Water Works Association.

E. AWWA C702 - Cold Water Meters -- Compound Type; American Water Works Association.

F. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Underwriters Laboratories Inc..

G. UL 404 - Gages, Indicating Pressure, for Compressed Gas Service; Underwriters Laboratories Inc..

1.03 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 PRESSURE GAGES

A. Manufacturers:
   1. Dwyer Instruments, Inc.: www.dwyer-inst.com.
   2. Moeller Instrument Co., Inc.: www.moellerinstrument.com.
   3. Omega Engineering, Inc.: www.omega.com.

B. Pressure Gages: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   1. Case: Steel with brass bourdon tube.
   2. Size: 4-1/2 inch diameter.
   3. Size: 2 inch diameter.
   4. Mid-Scale Accuracy: One percent.
   5. Scale: Psi.

2.02 STEM TYPE THERMOMETERS

A. Manufacturers:
   1. Dwyer Instruments, Inc.: www.dwyer-inst.com.
   2. Omega Engineering, Inc.: www.omega.com.
   3. Weksler Glass Thermometer Corp: www.wekslerglass.com.

B. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E 1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with

positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
1. Size: 9 inch scale.
2. Window: Clear Lexan.
3. Size: 7 inch scale.
4. Window: Clear glass.
5. Stem: 3/4 inch NPT brass.
6. Accuracy: 2 percent, per ASTM E 77.
7. Calibration: Degrees F.

2.03 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.04 TEST PLUGS

A. Manufacturer: Peterson Equipment Company Model Pete's Plug.

B. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel core for temperatures up to 350 degrees F.

C. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter pressure gages, one gage adapters with 1/8 inch probes, two 1 inch dial thermometers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide one pressure gage per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gage.

C. Install pressure gages with pulsation dampers. Provide gage cock to isolate each gage. Provide siphon on gages in steam systems. Extend nipples and siphons to allow clearance from insulation.

D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

E. Provide instruments with scale ranges selected according to service with largest appropriate scale.

F. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

G. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

H. Locate test plugs where indicated.

END OF SECTION

SECTION 15145

PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.
   1. Sanitary sewer.
   2. Domestic water.
   3. Gas.

1.02 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers.

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers (ANSI B16.18).

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.

D. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers (ANSI/ASME B31.1).

E. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers (ANSI/ASME B31.9).

F. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

G. ASTM A 234/A 234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

H. ASTM B 32 - Standard Specification for Solder Metal.

I. ASTM B 88 - Standard Specification for Seamless Copper Water Tube.

J. ASTM B 88M - Standard Specification for Seamless Copper Water Tube (Metric).

K. ASTM D 2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.

L. ASTM D 2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

M. ASTM D 2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

N. ASTM D 3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

O. AWS D10.9 - Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing.

P. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; American Water Works Association (ANSI/AWWA C105/A21.5).

Q. AWWA C651 - Disinfecting Water Mains; American Water Works Association (ANSI/AWWA C651).

R. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute.

S. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute.

T. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements.

U. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements.

V. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements.

W. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.

X. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

Y. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

Z. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

AA. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

AB. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

AC. NFPA 54 - National Fuel Gas Code; National Fire Protection Association.

AD. ASTM A 536 - Standard Specification for Ductile Iron Castings.

AE. ASTM F 1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for use in Piping Applications.

AF. AWWA C606 - Grooved and Shouldered Joints.

1.03 SUBMITTALS

A. Project Record Documents: Record actual locations of valves.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with State of Michigan, standards.

B. Valves: Bear UL and FMRC label or marking. Manufacturer's name and pressure rating marked on valve body.

C. Solder containing lead may not be used for any systems.

D. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

E. Test drainage piping systems in accordance with their respective and applicable governing codes. Test drainage and waste piping hydraulically by filling the system to its highest point or at a static head of 10 feet, whichever is higher.

F. Pressure test pluming piping (domestic cold water, domestic hot water, hot water recirculation, etc.) in accordance with governing and applicable codes. At minimum, test with water at 225 PSIG - permissible pressure drop shall be 0 PSIG over 2 hour period.

G. Pressure test natural gas and propane gas piping in accordance with governing and applicable codes. At minimum, test with air at 100 PSIG - permissible pressure drop shall be 0 PSIG over 2 hour period.

1.05 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State and local plumbing and mechanical codes.

B. Conform to applicable code for installation of backflow prevention devices.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 SANITARY SEWER WASTE AND VENT PIPING (SAN, V), BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: CISPI 301, hubless.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

B. PVC Pipe: ASTM D 2665 or ASTM D 3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D 2564 solvent cement.
   3. Note: All pipes passing under footings, or through foundation walls, shall be cast iron, hubless, service weight piping.

2.02 SANITARY WASTE AND VENT PIPING (SAN, V), ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. PVC Pipe: ASTM D 2665.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D 2564 solvent cement.
   3. Only use PVC piping where allowed by Building Codes - do not use PVC piping in return air plenums.
   4. PVC piping is not approved for use where exposed to damage (i.e. surface mounted in a storage room, mechanical room, etc.).

2.03 DOMESTIC COLD WATER PIPING (CW), BURIED WITHIN 5 FEET OF BUILDING

A. Soft Copper Tubing: Type K, ASTM B88, seamless and jointless soft copper tubing may be used for sizes 3 inch and smaller. No solder joints shall be permitted on below grade copper tubing.

B. Minimum System Pressure Rating: 160 psig.

2.04 DOMESTIC HOT WATER (HW), DOMESTIC COLD WATER (CW), AND DOMESTIC HOT WATER RETURN (HWR) PIPING, ABOVE GRADE

A. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

2. Joints: ASTM B 32, solder, Grade 95TA. Solder containing lead will not be permitted.

B. Minimum System Pressure Rating: 125 psig.

C. Isolation Valves: Ball valves for sizes 2 inch and smaller, gate or butterfly valves for sizes 2-1/2 inch and larger.

D. Exposed piping for sinks, toilets, urinals, etc. shall be chrome plated. Refer to fixture specifications for details.

E. PEX tubing, rated/approved for domestic water use, may be used for domestic cold/hot water run-outs/drops to individual fixtures that are 1/2" or 3/4". Note that PEX tubing interior diameters must match the internal diameter of type L copper tubing, therefore 3/4" PEX may need to be used to match a 1/2" copper tube, 1" PEX may be needed to match a 3/4" copper tube, etc.. Pipe diameters shown on plans are for type L copper tubing.

2.05 NATURAL GAS PIPING (G), BURIED WITHIN 5 FEET OF BUILDING

A. Steel Pipe: ASTM A 53/A 53M Schedule 40 black.
   1. Fittings: ASTM A 234/A 234M, wrought steel welding type.
   2. Joints: ASME B31.1, welded.
   3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

B. Soft Copper Tubing: ASTM B88, seamless and jointless soft copper tubing may be used for sizes 2 inch and smaller. No solder joints shall be permitted on below grade copper tubing.

C. For sizes 2" and less: Pre-sleeved stainless steel flexible gas pipe with fully ventable polyethylene sleeve. Manufacturer: OmegaFlex "TracPipe PS-2".

2.06 NATURAL GAS PIPING (G), ABOVE GRADE

A. Steel Pipe: ASTM A 53/A 53M Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A 234/A 234M, wrought steel welding type.
   2. Joints: NFPA 54, threaded or welded to ASME B31.1.

B. Corrugated Stainless Steel Tubing (CSST): ASTM A240, type 304 stainless steel with a minimum nominal wall thickness of 0.010 inches. System shall comply with ANSI LC-1 "Standard for Fuel Gas Piping Using Corrugated Stainless Steel Tubing (CSST), and carrying listings by CSA International (Certification Number 1009875), ICC Evaluation Services (Report Number ESR-1031) and IAPMO Research & Testing (Certificate of Listing Number 3250).
   1. Fittings: Corrugated stainless steel tube fittings: Mechanical tube fittings manufactured from ASTM B16 type 360 brass whose design incorporates a double wall flare for gas-tight seal with mechanical capture of the jacket for enhanced tubing protection. Include ends with threads according to ASME B1.20.1 for connection to threaded pipe or fittings.
   2. Protective Coating: Furnish corrugated stainless steel tubing with factory-applied corrosion -resistant polyethylene jacket for use in corrosive atmosphere. Coating properties include the following:
      a. Corrugated stainless steel tube jacket shall be UV-Resistant polyethylene meeting the requirements of ASTM E84 for flame spread and smoke density.
   3. Low pressure, 0.5 psig (14 inch Water Column) or less, Natural Gas Systems: Use the following :
      a. 1/2 to 2-inch NPS: Corrugated stainless steel tube and brass fittings.
   4. Medium pressure, over 0.5 psig (14 inch Water Column) up to 5 psig, Natural Gas Systems: Use the following :
      a. 1/2 to 2-inch NPS: Corrugated stainless steel tube and brass fittings.

C. Isolation Valves: AGA approved and UL listed ball valves for sizes 3 inch and smaller and UL listed lubricated plug valves for sizes 4 inches and larger.

2.07 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:
   1. Ferrous pipe: Class 150 malleable iron threaded unions.
   2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch:
   1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
      a. Flange Adapter: Flat face, ductile iron housings with elastomer pressure responsive gasket, for direct connection to ANSI Class 125 or 150 flanged components. Victaulic Style 741 (or approved equal).
   2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Dielectric Connections: Union or waterway fitting with galvanized or plated steel threaded end, grooved end, copper solder end, water impervious isolation barrier. Victaulic Style 47 (or approved equal).

2.08 PIPE HANGERS AND SUPPORTS

A. Plumbing Piping - Drain, Waste, and Vent:
   1. Conform to ASME B31.9.
   2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Carbon steel, adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
   7. Vertical Support: Steel riser clamp.
   8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

B. Plumbing Piping - Water:
   1. Conform to ASME B31.9.
   2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Carbon steel, adjustable swivel, split ring.
   3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
   5. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
   6. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded supports or spacers and hanger rods, cast iron roll.
   7. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   8. Vertical Support: Steel riser clamp.
   9. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   10. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
   11. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
   1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
   2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
   3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
   4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
   5. Concrete Adhesive Type Achors: Complying with ICC-ES AC308.
   6. Other Types: As required.

2.09 GLOBE VALVES

A. Manufacturers:

1. Conbraco Industries: www.conbraco.com.
2. Nibco, Inc.: www.nibco.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Up To and Including 3 Inches:
1. MSS SP-80, Class 125, bronze body, bronze trim, handwheel, bronze disc, solder or threaded ends.

C. 2 Inches and Larger:
1. MSS SP-85, Class 125, iron body, bronze trim, handwheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Provide chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.10 BALL VALVES

A. Manufacturers:
1. Conbraco Industries: www.conbraco.com.
2. Nibco, Inc.: www.nibco.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder or threaded ends with union.

C. Ball valves for natural gas service shall be UL labeled for such service.

2.11 PLUG VALVES

A. Manufacturers:
1. Conbraco Industries.
2. Nibco, Inc.
3. Milwaukee Valve Company.

B. Construction 2-1/2 Inches and Larger: MSS SP-78, 175 psi CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged ends. Provide lever operator with set screw.

2.12 FLOW CONTROLS

A. Manufacturers:
1. ITT Bell & Gossett: www.bellgossett.com.
2. Griswold Controls: www.griswoldcontrols.com.
3. Taco, Inc.: www.taco-hvac.com.

B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

2.13 SWING CHECK VALVES

A. Manufacturers:
1. Hammond Valve: www.hammondvalve.com.
2. Nibco, Inc.: www.nibco.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Up to 2 Inches:
1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder or threaded ends.

C. Over 2 Inches:
1. MSS SP-71, Class 125, iron body, bronze swing disc, renewable disc seal and seat, flanged

ends.

2.14 SPRING LOADED (SILENT) CHECK VALVES

A. Manufacturers:
   1. Hammond Valve: www.hammondvalve.com.
   2. Crane Co.: www.cranevalve.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.
   4. Nibco.

B. Valve minimum pressure rating shall match or exceed system pressure rating, iron body, bronze or stainless steel trim, stainless steel springs, aluminum-bronze disc, EPDM, Nitrile, or Buna N seals, wafer style ends in 2 inches and smaller, flanged or grooved ends in sizes greater than 2 inches.

2.15 STRAINERS

A. Manufacturers:
   1. Armstrong International, Inc.: www.armstronginternational.com.
   2. Green Country Filtration: greencountryfiltration.com.
   3. WEAMCO: www.weamco.com.

B. Size 2 inch and Under:
   1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen. Provide with integral blowdown valve and hose end fitting.
   2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen. Provide with integral blowdown valve and hose end fitting.

2.16 PIPING TRANSITIONS

A. Manufacturers:
   1. Can-Tex Industries Div. of Harsco Corp.; Model CT-Adapters:
   2. Fernco Joint Sealer Co.; Model PVC Donut
   3. Joint, Inc.; Model Caulder.

B. Provide transitions for jointing two different types of pipe materials such as cast iron, clay, steel, plastic, or copper. Fabricate transitions with bushings capable of resisting normal moisture corrosion.

2.17 SURFACE PENETRATION SLEEVES

A. Manufacturers:
   1. Thunderline Corp.; Model Link Seal:

B. Sleeves: Schedule 40 weight, black, carbon steel pipe with anchor lugs, except where continuously welded seal rings are indicated.

C. Mechanically expandable elastomer seal devices.

D. Application: Seal pipes to sleeve through foundation floors, walls, underground or grade supported slabs.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with grooved couplings, flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 15082.

H. Provide access where valves and fittings are not exposed.

I. Establish elevations of buried piping outside the building to ensure not less than 4' of cover.

J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

K. Provide support for utility meters in accordance with requirements of utility companies.

L. Install concrete thrust blocks at elbows of underground domestic water service piping.

M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09900.

N. Install bell and spigot pipe with bell end upstream.

O. Install valves with stems upright or horizontal, not inverted.

P. Install water piping to ASME B31.9.

Q. Gas piping shall be painted per specification section 09900 and mechanical and building code requirements.

R. Vent sleeved gas piping that is buried below building slab per fuel gas code requirements.

S. PVC Pipe: Make solvent-welded joints in accordance with ASTM D 2855.

T. Sleeve pipes passing through partitions, walls and floors.

U. Each fixture shall have isolation valves provided. All run-outs from piping mains to fixtures shall have isolation valves installed near the main take-off, whether shown on the plans or not. All isolation valves shall be located in accessible locations.

V. Minimum underground sanitary pipe size shall be 3".

W. All fixtures shall be vented in accordance with a venting method approved by the ruling Plumbing Code.

X. All plumbing vents through the roof shall be located a minimum of 24" from the edge of the parapet or edge of roof.

Y. All plumbing vents through the roof shall be located a minimum of 10 feet from any building outdoor air intake (i.e. louvers, windows, etc.).

Z. Do not route/locate below grade piping below, or with 45 degrees of the bottom corner of, foundation walls/footings. Coordinate with structural trades prior to installing piping.

AA. Inserts:
1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

AB. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.
9. Prime coat exposed steel hangers and supports. Refer to Section 09900. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
10. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 15072.
11. Support cast iron drainage piping at every joint.
12. Install concrete thrust blocks at all elbows and tees on all below grade water piping.

3.04 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Install globe or ball valves for throttling, bypass, or manual flow control services.

E. Provide spring loaded check valves on discharge of water pumps.

F. Provide plug valves in natural gas systems for shut-off service.

G. Provide flow controls in water recirculating systems where indicated.

3.05 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot slope, for pipes 3 inches - 6 inches in diameter.

Pipes smaller than 3 inches in diameter shall drain at minimum 1/4 inch per foot slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 11 inch wg. Coordinate flow and pressure requirements with gas utility.

C. Provide new domestic water service complete with well pressure tanks and piping as shown on the plans. Coordinate with well contractor and electrical contractor.

3.08 SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe size: 1/2 inches to 1-1/4 inches:
         1) Maximum hanger spacing: 6.5 ft.
         2) Hanger rod diameter: 3/8 inches.
      b. Pipe size: 1-1/2 inches to 2 inches:
         1) Maximum hanger spacing: 10 ft.
         2) Hanger rod diameter: 3/8 inch.
      c. Pipe size: 2-1/2 inches to 3 inches:
         1) Maximum hanger spacing: 10 ft.
         2) Hanger rod diameter: 1/2 inch.
      d. Pipe size: 4 inches to 6 inches:
         1) Maximum hanger spacing: 10 ft.
         2) Hanger rod diameter: 5/8 inch.
   2. Plastic Piping:
      a. All Sizes:
         1) Maximum hanger spacing: 6 ft.
         2) Hanger rod diameter: 3/8 inch.

END OF SECTION

SECTION 15146

PLUMBING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floor drains.

B. Trap Primers.

C. Cleanouts.

D. Hose bibs.

E. Hydrants.

F. Water hammer arrestors.

G. Thermostatic mixing valves.

1.02 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor and Trench Drains; The American Society of Mechanical Engineers.

B. ASME A112.6.4 - Roof, Deck, and Balcony Drains; The American Society of Mechanical Engineers.

C. ASSE 1011 - Hose Connection Vacuum Breakers; American Society of Sanitary Engineering (ANSI/ASSE 1011).

D. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent; American Society of Sanitary Engineering (ANSI/ASSE 1012).

E. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering (ANSI/ASSE 1019).

F. PDI-WH 201 - Water Hammer Arresters; Plumbing and Drainage Institute.

1.03 SUBMITTALS

A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

C. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

D. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.

E. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than 10 years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

1.06 EXTRA MATERIALS

A. Supply for OWNER's use in maintenance of project:

1. Two loose keys for outside wall hydrants.
2. Two hose end vacuum breakers for hose bibs.
3. Two service kits for thermostatic mixing valves.
4. Two spare trap seal primers.

PART 2 PRODUCTS

2.01 DRAINS

A. Manufacturers:
1. Josam Company: www.josam.com.
2. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
3. Zurn Industries, Inc.: www.zurn.com.
4. Wade.

B. Floor Drain (FD-1):
1. ASME A112.21.1M; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, trap primer connection, and adjustable round nickel-bronze strainer.
2. Lacquered finish is standard. Use clamping collar on floors above grade. This is a standard floor drain used in toilet rooms, janitor's closets, showers, etc.
3. Zurn model # Z-415 (with type B-strainer), JR Smith model # 2005, or equal.

C. Floor Drain (FD-2):
1. ASME A112.21.1M; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and adjustable square nickel-bronze strainer with removable perforated sediment bucket, and trap primer connection.
2. Provide this floor drain in mechanical rooms, penthouses, etc. They are the same as FD-1 with sediment bucket and square strainer option.
3. Zurn model # Z-415 (with type S-strainer), JR Smith model # 2005, or equal.

D. Floor Drain (FD-3):
1. ASME A112.6.3; lacquered cast iron two piece body with double drainage flange, trap primer connection, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer with removable/adjustable polished bronze funnel.
2. Provide this floor drain in equipment rooms and elsewhere for picking up indirect waste.
3. Zurn model # Z-415 (with removable funnel), JR Smith model # 3510 (with FX removable funnel), or equal.

E. Wood Deck Floor Drains:
1. PVC or cast iron body with a steel anchor flange.
2. Product: Zurn light commercial FD-2240 series, or equal.

2.02 TRAP PRIMERS

A. Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Zurn Industries, Inc.: www.zurn.com.
3. Precision Plumbing Products, Inc. (PPP Inc.).

B. For single trap primer installations:
1. Install JR smith "PRIME-ESE" P-trap trap primer on the sanitary outlet of lavatories or drinking fountains.
2. Install PPP Inc. model P1 or P2 trap primer valve on domestic cold water supply pipe (maximum 1-1/2") feeding nearby sink, lavatory, water cooler, etc.

C. For multiple trap primer installations:
1. Install PPP Inc. model P1 or P2 trap primer valve and PPP Inc. trap primer distribution unit with up to 4 outlets to up to 8 floor drains.

2.03 CLEANOUTS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
   2. Josam Company: www.josam.com.
   3. Zurn Industries, Inc.: www.zurn.com.
   4. Wade.

B. Cleanouts at Exterior Surfaced Areas (CO-1):
   1. Round cast nickel bronze access frame and non-skid cover.

C. Cleanouts at Exterior Unsurfaced Areas (CO-2):
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.

D. Cleanouts at Interior Finished Floor Areas (CO-3):
   1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

E. Cleanouts at Interior Finished Wall Areas (CO-4):
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

F. Cleanouts at Interior Unfinished Accessible Areas (CO-5): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.04 HOSE BIBBS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
   2. Watts Regulator Company: www.wattsregulator.com.
   3. Zurn Industries, Inc.: www.zurn.com.
   4. Wade.
   5. Woodford.

B. Interior Hose Bibs (HB-1):
   1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, 3/4 inch hose thread spout, chrome plated where exposed with handwheel, integral vacuum breaker in conformance with ASSE 1011. Half turn handle. 3/4" inlet.
   2. Product: Woodford model 40HT.

C. Interior Mixing Type Hose Bibs (HB-2):
   1. Wall mounted, double service faucet with 3/4 inch hose thread spout, integral stops, chrome plated where exposed with handwheels, and vacuum breaker in conformance with ASSE 1011.
   2. Product: Woodford model C22CC or equal.

2.05 HYDRANTS

A. Manufacturers:
   1. Arrowhead Brass Company: www.arrowheadbrass.com.
   2. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
   3. Zurn Industries, Inc.: www.zurn.com.
   4. Wade.
   5. Woodford.

B. Wall Hydrants with recessed box (WH-1):
   1. ASSE 1019; freeze resistant, self-draining type with chrome plated lockable recessed box hose thread spout, lockshield and removable key, and integral vacuum breaker.
   2. Product: Woodford model B65 or equal.

C. Wall Hydrants exposed wall plate type (WH-2):

1. ASSE 1019; freeze resistant, self-draining type with chrome plated wall plate hose thread spout, lockshield and removable key, and integral vacuum breaker.
2. Product: Woodford model B65 or equal.

2.06 WASHING MACHINE BOXES AND VALVES

A. Box Manufacturers:
1. IPS Corporation/Water-Tite: www.ipscorp.com.
2. Oatey: www.oatey.com.

B. Valve Manufacturers:
1. IPS Corporation/Water-Tite: www.ipscorp.com.
2. Zurn Industries, Inc.: www.zurn.com.

C. Description: Plastic preformed rough-in box with brass long shank valves with wheel handles, socket for 2 inch waste, slip in finishing cover.

2.07 REFRIGERATOR VALVE AND RECESSED BOX

A. Box Manufacturers:
1. IPS Corporation/Water-Tite: www.ipscorp.com.
2. Oatey: www.oatey.com.

B. Valve Manufacturers:
1. IPS Corporation/Water-Tite: www.ipscorp.com.
2. Zurn Industries, Inc.: www.zurn.com.

C. Description: Plastic preformed rough-in box with brass valves with wheel handle, slip in finishing cover.

2.08 WATER HAMMER ARRESTORS

A. Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Watts Regulator Company: www.wattsregulator.com.
3. Zurn Industries, Inc.: www.zurn.com.

B. Water Hammer Arrestors:
1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 150 psi working pressure.

2.09 MIXING VALVES

A. Thermostatic Mixing Valves; Point of Use:
1. Manufacturers:
   a. ESBE: www.esbe.se.
   b. Leonard Valve Company: www.leonardvalve.com
   c. Lawler.
   d. Watts: Model MMV-M1.
2. Valve: Bronze body, stainless steel disc and spring, integral temperature adjustment cap with locking feature. Copper thermostat assembly. Buna-N; EPDM O'rings. Integral filter washers and check valves on hot and cold water inlets. ASSE 1070 listed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Cleanouts:
1. Cleanouts shall be installed in accessible locations and provided in any horizontal drainage line which changes direction more than 45 degrees, at the ends of main and branch runs,

base of stacks, and at all traps

2. Cleanouts in horizontal drainage lines located inside the building shall be provided at maximum spacing of 50 feet for drains 4 inches and smaller. All horizontal drainage lines inside the building larger than 4 inches shall have cleanouts spaced at a maximum of 100 feet.
3. Provide cleanouts in any drainage line that penetrates building exterior walls. Cleanouts shall be either inside or outside of the building.
4. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
5. Encase exterior cleanouts in concrete flush with grade.
6. Install floor cleanouts at elevation to accommodate finished floor.
7. Provide code required clearances for all cleanouts.

C. Floor drains:
1. Coordinate installation of floor drains with the work of placing concrete to assure proper drain elevation and floor slope.
2. Cast floor drains into the concrete at the time the floors are placed and make watertight.
3. Floor drains in above ground slabs shall be flashed with separate finish with square lead sheet pans. Floor drains in slabs on grade provided with membrane or metal pan waterproofing do not require lead flashing, but shall have two additional layers of the waterproofing at the floor drains. Flashing shall not obstruct the weepholes.
4. Floor drain trap size shall match the outlet size of the drain and the size shown on the plans. Minimum floor drain outlet/piping size shall be 3".
5. Floor drain traps subject to loss by evaporation (i.e. storage rooms, mechanical rooms, bathrooms, etc.) shall have a deep seal trap consisting of at least a 4 inch seal, a trap primer connection, and be protected by a trap primer valve.
   a. Trap Primers:
      1) Trap primer shall be provided for all floor drains subject to loss of seal by evaporation (i.e. storage rooms, bathrooms, mechanical rooms, etc.).
      2) Tap off top of domestic cold water main pipe feeding nearby plumbing fixture.
      3) Trap primer valves shall be installed in concealed but accessible locations for maintenance.

D. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on irrigation systems, interior and exterior hose bibs, etc..

E. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories, sinks, washing machine outlets, water closets, urinals, dishwashers, bathtubs/showers, and other applicable fixture locations with quick closing valves.

F. Install ASSE 1070 listed "point of use" thermostatic mixing valves at all accessible fixtures (lavatories, sinks, etc.). Provide Lav-Shields under lavatories to conceal mixing valves.

END OF SECTION

SECTION 15410

PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water closets.

B. Lavatories.

C. Sinks.

D. Service sinks.

E. Electric water coolers.

F. Showers.

1.02 REFERENCE STANDARDS

A. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers.

B. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers.

1.03 SUBMITTALS

A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

B. Maintenance Data: Include installation instructions, operation, maintenance data, spare and replacement parts lists, exploded assembly views, and fixture trim exploded view.

C. Warranty: Submit manufacturer warranty and ensure forms have been completed in OWNER's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 10 years of documented experience.

1.05 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.07 FIELD MEASUREMENTS

A. Confirm that millwork/casework is constructed with adequate provision for the installation of countertop lavatories and sinks.

1.08 EXTRA MATERIALS

A. Supply two sets of faucet washers, flush valve service kits, and lavatory supply fittings.

PART 2 PRODUCTS

2.01 TANK TYPE WATER CLOSETS

A. Tank Type Water Closet Manufacturers:
   1. American Standard Inc.: www.americanstandard.com.
   2. Eljer.
   3. Kohler Company: www.kohler.com.

B. Refer to plumbing fixture schedule.

C. Seat Manufacturers:
   1. Bemis Manufacturing Company: www.bemismfg.com.
   2. Church Seat Company: www.churchseats.com.
   3. Olsonite: www.olsonite.com.
   4. Centoco.

D. Seat:
   1. Solid white plastic, open front, extended back, less cover, complete with self-sustaining hinge.

2.02 LAVATORIES

A. Lavatory Manufacturers:
   1. American Standard Inc.: www.americanstandard.com.
   2. Eljer.
   3. Kohler Company: www.kohler.com.
   4. Zurn.

B. Refer to plumbing fixture schedule.

C. Supply Faucet Manufacturers:
   1. American Standard Inc.: www.americanstandard.com.
   2. Kohler Company: www.kohler.com.
   3. Chicago Faucet.
   4. Delta.
   5. Zurn.
   6. Sloan.

D. Accessories:
   1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
   2. Offset waste with perforated open strainer.
   3. Screwdriver stops.
   4. Rigid supplies.
   5. Wall Mounted Lavatory Carrier:
      a. Manufacturers:
         1) JOSAM Company: www.josam.com.
         2) Sloan Valve Company.
         3) Zurn Industries, Inc.: www.zurn.com.
         4) JR Smith.
      b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

2.03 SINKS

A. Sink Manufacturers:
   1. American Standard Inc.: www.americanstandard.com.
   2. Eljer.
   3. Kohler Company: www.kohler.com.
   4. Just.
   5. Elkay.

B. Refer to plumbing fixture schedule.

C. Supply Faucet Manufacturers:
   1. American Standard Inc.: www.americanstandard.com.
   2. Eljer: www.eljer.com.
   3. Kohler Company: www.kohlerco.com.
   4. Elkay.
   5. Chicago Faucet.
   6. Delta.
   7. Zurn.

D. Accessories: Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, screwdriver stop, rigid supplies.

2.04 PANEL SHOWERS

A. Manufacturers:
   1. Bradley.
   2. Leonard.
   3. Acorn.

B. Refer to plumbing fixture schedule.

2.05 ELECTRIC WATER COOLERS

A. Electric Water Cooler Manufacturers:
   1. Tri Palm International/Oasis: www.tripalmint.com.
   2. Elkay Manufacturing Company: www.elkay.com.
   3. Haws Corporation: www.hawsco.com.
   4. Halsey Taylor.

B. Refer to plumbing fixture schedule.

2.06 SERVICE SINKS

A. Service Sink Manufacturers:
   1. Elkay Manufacturing Company: www.elkay.com.
   2. Just Manufacturing Company: www.justmfg.com.
   3. EL Mustee.
   4. Kohler.
   5. American Standard.
   6. Fiat.
   7. Acorn.
   8. Floorstone.

B. Refer to plumbing fixture schedule.

C. Trim:
   1. ASME A112.18.1M exposed wall type supply with lever handles, spout wall brace, vacuum breaker, hose end spout, bucket hook, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

D. Accessories:
   1. 5 feet of 1/2 inch diameter plain end reinforced rubber hose.
   2. Hose clamp hanger.
   3. Mop hanger.
   4. Vinyl wall guards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install each fixture with trap, easily removable for servicing and cleaning.

C. Provide chrome plated rigid supplies to fixtures with screwdriver stops, reducers, and escutcheons.

D. Install components level and plumb.

E. Install and secure fixtures in place with wall carriers and bolts.

F. Seal fixtures to wall and floor surfaces with sealant, color to match fixture.

G. Furnish and install all plumbing fixtures complete with all supply, soil, waste and vent piping connections; together with all fittings, supports, fastening devices, cocks, valves and appurtenances required to complete installations.

H. All faucets and exposed traps, fittings, trim, connections, etc. shall be of polished chromium plated brass unless otherwise specified.

I. Chrome plated pipe, valves and fittings shall be installed with strap wrenches and padded tools to avoid damage to chrome plated surfaces.

J. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

K. Install "Lav-Shields" below wall mounted lavatories/sinks to completely conceal exposed piping/traps/mixing valves/etc.

L. Install "Lav-Guards" below counter mounted lavatories/sinks to cover exposed piping/traps.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

B. Coordinate fixture heights and installation with architectural plans, details, sections, and elevations.

3.05 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace damaged products before Date of Substantial Completion.

C. Do not permit use of fixtures until fixtures and equipment are final cleaned.

3.08 SCHEDULES

A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
   1. Water Closet:
      a. Standard: 15 inches to top of bowl rim.
      b. Accessible: 18 inches to top of seat.
   2. Lavatory:
      a. Standard: 31 inches to top of basin rim.
      b. Accessible: 34 inches to top of basin rim.
   3. Drinking Fountain:
      a. Standard Adult: 40 inches to top of basin rim.
      b. Accessible: 36 inches to top of spout.
   4. Shower Heads:
      a. Adult Male: 69.5 inches to bottom of head.
      b. Adult Female: 64.5 inches to bottom of head.
      c. Child: 58.5 inches to bottom of head.

B. Coordinate fixture heights and installation with architectural plans, details, sections, and elevations.

C. Fixture Rough-In
   1. Water Closet (Tank Type):
      a. Cold Water: 1/2 Inch.
      b. Waste: 4 Inch.
      c. Vent: 2 Inch.
   2. Lavatory:
      a. Hot Water: 1/2 Inch.
      b. Cold Water: 1/2 Inch.
      c. Waste: 1-1/2 Inch.
      d. Vent: 1-1/4 Inch.
   3. Sink:
      a. Hot Water: 1/2 Inch.
      b. Cold Water: 1/2 Inch.
      c. Waste: 1-1/2 Inch.
      d. Vent: 1-1/4 Inch.
   4. Service Sink:
      a. Hot Water: 1/2 Inch.
      b. Cold Water: 1/2 Inch.
      c. Waste: 3 Inch.
      d. Vent: 1-1/2 Inch.
   5. Electric Water Cooler:
      a. Cold Water: 1/2 Inch.
      b. Waste: 1-1/4 Inch.
      c. Vent: 1-1/4 Inch.
   6. Shower:
      a. Hot Water: 1/2 Inch.
      b. Cold Water: 1/2 Inch.
      c. Waste: 1-1/2 Inch.
      d. Vent: 1-1/4 Inch.
   7. Hose Bibs and Wall Hydrants:
      a. Cold Water: 3/4 Inch.

END OF SECTION

SECTION 15430

PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water Heaters.

B. Water storage tanks.

C. Pumps.
   1. Circulators.

1.02 REFERENCE STANDARDS

A. ANSI Z21.10.1 - Gas Water Heaters - Volume I - Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less.

B. ANSI Z21.10.3 - Gas Water Heaters - Volume III - Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous Water Heaters.

C. ASME (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers.

D. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Underwriters Laboratories Inc..

E. UL 1453 - Standard for Electric Booster and Commercial Storage Tank Water Heaters; Underwriters Laboratories Inc..

1.03 SUBMITTALS

A. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Indicate pump type, capacity, power requirements.
   3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
   4. Provide electrical characteristics and connection requirements.

B. Shop Drawings:
   1. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

C. Project Record Documents: Record actual locations of components.

D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in OWNER's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 10 years of documented experience.

B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

C. Performance: Ensure pumps operate at specified system fluid temperatures without vapor

binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.05 CERTIFICATIONS

A. Water Heaters: NSF approved.

B. Gas Water Heaters: Certified by CSA International to ANSI Z21.10.1 or ANSI Z21.10.3, as applicable, in addition to requirements specified elsewhere.

C. Electric Water Heaters: UL listed and labeled to UL 174 or UL 1453.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.07 EXTRA MATERIALS

A. Provide two pump seals.

PART 2 PRODUCTS

2.01 WATER HEATER MANUFACTURERS

A. A.O. Smith Water Products Co: www.hotwater.com.

B. Bock Water Heaters, Inc.: www.bockwaterheaters.com.

C. Rheem Manufacturing Company: www.rheem.com.

D. Lochinvar.

E. Bradford White.

2.02 HIGH EFFICIENCY TANK-TYPE GAS FIRED WATER HEATERS

A. Type: Fully condensing, 94% efficient, natural gas-fired, vertical storage type water heater.

B. Tank: Glass lined welded steel, fully condensing flue coil coated with acid resistant glass lining, multiple flue passages, inspection port, thermally insulated with minimum 2 inches glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.

C. Venting: 3 inch, or 4 inch, PVC venting, direct vent sealed combustion, horizontal or vertical.

D. Power Burner: Power burner that has jet flame shooting down the submerged combustion chamber in a spiral action.

E. Accessories: Brass water connections and dip tube, drain valve, magnesium anode, and ASME rated temperature and pressure relief valve.

F. Controls: A microprocessor controls the ignition and thermostat allows precise setting of water temperatures from 110 deg F to 180 deg F. A digital display panel indicates the operating mode, all user settings, and any failure modes.

G. Product: Lochinvar TurboCharger.

H. Other approved manufacturers:
   1. AO Smith Cyclone.
   2. Bradford White.

2.03 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Manufacturers:
   1. Amtrol Inc.: www.amtrol.com.

2. ITT Bell & Gossett: www.bellgossett.com.
3. Taco, Inc.: www.taco-hvac.com.

B. Construction: Welded steel, tested and stamped in accordance with ASME (BPV VIII, 1); supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

C. Accessories: Pressure gage and air-charging fitting, tank drain; precharge to 12 psig.

2.04 IN-LINE CIRCULATOR PUMPS

A. Manufacturers:
1. Armstrong Pumps Inc.: www.armstrongpumps.com.
2. ITT Bell & Gossett: www.bellgossett.com.
3. Taco.

B. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.

C. Impeller: Bronze.

D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

E. Seal: Carbon rotating against a stationary ceramic seat.

F. Drive: Flexible coupling.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related fuel piping, gas venting, and electrical work to achieve operating system.

END OF SECTION

SECTION 15536

FORCED AIR FURNACES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Forced air furnaces.

B. Refrigerant cooling coils.

C. Air cooled condensing units.

D. Humidifiers.

E. Controls.

1.02 REFERENCES

A. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning and Refrigeration Institute.

B. ARI 520 - Positive Displacement Condensing Units; Air-Conditioning and Refrigeration Institute.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc..

D. ASHRAE Std 23 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc..

E. ASHRAE Std 90.1 - Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc..

F. ASHRAE Std 103 - Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc..

G. NFPA 54 - National Fuel Gas Code; National Fire Protection Association.

H. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association.

I. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association.

J. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; National Fire Protection Association.

K. UL 207 - Refrigerant-Containing Components and Accessories, Non-Electrical; Underwriters Laboratories Inc..

1.03 SUBMITTALS

A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

B. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.
   1. Design Data: Indicate refrigerant pipe sizing.

C. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

D. Project Record Documents: Record actual locations of components and connections.

E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

F. Warranty: Submit manufacturer’s warranty and ensure forms have been filled out in OWNER s name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 10 years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum 10 years of experience and approved by manufacturer.

1.05 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 WARRANTY

A. Provide three year manufacturer’s warranty for solid state ignition modules.

B. Provide five year manufacturer’s warranty for heat exchangers, condensing units, and compressors.

1.07 EXTRA MATERIALS

A. Provide two filters for each furnace.

PART 2 PRODUCTS

2.01 FURNACE MANUFACTURERS

A. The Carrier Corporation: www.carrier.com.

B. The Trane Company: www.trane.com.

C. York International Corporation: www.york.com.

D. Heil.

E. Bryant.

F. Goodman.

2.02 GAS FIRED FURNACES

A. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating element, controls, air filter, humidifier, and accessories; wired for single power connection with control transformer.
   1. Heating: Natural gas fired.
   2. Electric Refrigeration: Refrigerant cooling coil and outdoor package containing compressor, condenser coil and condenser fan.
   3. Accessories:
      a. Concentric roof termination kit.
      b. Media air cleaner: Honeywell model F150E with Airwatch filter change indicator, or equal. Provide one extra set of filters for Owner's use. Install turning vanes at elbow into media air cleaner.
      c. By-pass pass through type humidifier: Honeywell model HE265B with humidity controls, or equal.

B. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety

interlock switches, glass fiber insulation with reflective liner.

C. Supply Fan: Centrifugal type rubber mounted with direct drive with adjustable variable speed motor.

D. Motor: 1750 rpm multiple speed, permanently lubricated.

E. Heat Exchanger: Aluminized and stainless steel tubular type.

F. Gas Burner:
   1. Sealed combustion type with adjustable combustion air supply,
   2. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
   3. Electronic pilot ignition, with electric spark igniter.
   4. Non-corrosive combustion air blower with permanently lubricated motor.

G. Gas Burner Safety Controls:
   1. Thermocouple sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
   2. Vent safety shutoff sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
   3. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.

H. Operating Controls
   1. Room Thermostat: Cycles burner to maintain room temperature setting.
   2. Supply Fan Control: Energize from bonnet temperature independent of burner controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation. Provide continuous low speed fan operation.

I. Air Filters: 2 inch thick glass fiber, disposable type arranged for easy replacement.

J. Performance:
   1. Ratings: Energy Efficiency Rating (EER) not less than requirements of ASHRAE Std 90.1; seasonal efficiency to ASHRAE Std 103.
   2. Refer to Furnace Schedule. Gas heating capacities are sea level ratings.

2.03 EVAPORATOR COIL UNITS

A. Manufacturers:
   1. The Carrier Corporation: www.carrier.com.
   2. The Trane Company: www.trane.com.
   3. York International Corporation: www.york.com.
   4. Heil.
   5. Bryant.
   6. Goodman.

B. Construction and Ratings: In accordance with ARI 210/240 and UL 207.

C. Evaporator Coil: Copper tube aluminum fin assembly, galvanized drain pan, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve, steel cabinet with baked enamel finish and insulation.

D. Cooling Capacity:
   1. Refer to Schedule.

2.04 CONDENSING UNITS

A. Manufacturers:
   1. The Carrier Corporation: www.carrier.com.
   2. The Trane Company: www.trane.com.
   3. York International Corporation: www.york.com.

4. Heil.
5. Bryant.
6. Goodman.

B. Construction and Ratings: In accordance with ARI 210/240 and UL 207. Testing: ASHRAE Std 23.

C. Compressor: ARI 520; hermetic, 3600 rpm, resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling.

D. Refrigeration Accessories: Filter Drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line). Provide thermostatic expansion valves. Provide refrigerant lines, factory cleaned, dried, pressurized and sealed, with insulated suction line.

E. Air Cooled Condenser: ARI 520; Aluminum fin and copper tube coil, with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

2.05 THERMOSTATS

A. Manufacturers:
1. The Carrier Corporation: www.carrier.com.
2. The Trane Company: www.trane.com.
3. York International Corporation: www.york.com.
4. Honeywell.
5. White Rogers.

B. Electric solid state microcomputer based room thermostat with remote sensor:
1. Automatic switching from heating to cooling.
2. Preferential rate control to minimize overshoot and deviation from setpoint.
3. Set-up for four separate temperatures per day.
4. Instant override of setpoint for continuous or timed period from one hour to 31 days.
5. Short cycle protection.
6. Programming based on every day of the week.
7. Selection features including degree F or degree C display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.
8. Battery replacement without program loss.
9. Thermostat display:
   a. Time of day.
   b. Actual room temperature.
   c. Programmed temperature.
   d. Programmed time.
   e. Duration of timed override.
   f. Day of week.
   g. System mode indication: heating, cooling, fan auto, off, and on, auto or on, off.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floors are ready for installation of units and openings are as indicated on shop drawings. Verify that supports for air cooled condensers are completed.

B. Verify that proper power supply is available for furnace and condenser package.

C. Verify that proper fuel supply is available for connection.

D. Verify that water supply is available for humidifier.

3.02 INSTALLATION

A. Install in accordance with NFPA 90A and NFPA 90B.

B. Install gas fired furnaces in accordance with NFPA 54.

C. Provide vent connections in accordance with NFPA 211.

D. Install refrigeration systems in accordance with ASHRAE Std 15.

E. Pipe drain from cooling coils and humidifiers to nearest floor drain.

F. Connect ductwork to furnaces with flexible duct connectors.

G. Route refrigerant piping from indoor coils to outdoor condensing units thru walls, below slab, and below grade concealed/encased in PVC conduit. Maintain access to piping/valves where required for maintenance.

END OF SECTION

SECTION 15544

FUEL FIRED UNIT HEATERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gas fired unit heaters.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ANSI/ASHRAE/IESNA Std 90.1).

B. ASHRAE Std 103 - Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc..

C. NFPA 54 - National Fuel Gas Code; National Fire Protection Association.

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association.

E. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; National Fire Protection Association.

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

B. Shop Drawings: Indicate assembly, required clearances, and locations and sizes of field connections.

C. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listing.

E. Warranty: Submit manufacturer’s warranty and ensure forms have been filled out in OWNER s name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 10 years of documented experience.

1.05 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 WARRANTY

A. Provide five year manufacturer’s warranty for heat exchangers.

PART 2 PRODUCTS

2.01 UNIT HEATER MANUFACTURERS

A. Modine Manufacturing Company.

B. Sterling Gas Division of Mestek, Inc.

C. Reznor/Thomas & Betts Corporation: www.reznoronline.com.

2.02 GAS FIRED UNIT HEATERS

A. Unit Heaters: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heat exchanger, burner, controls, and accessories:
   1. Discharge Louvers: Individually adjustable horizontal and vertical louvers to match cabinet finish.

B. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors, glass fiber insulation and reflective liner.

C. Supply Fan: Propeller type with direct drive.

D. Heat Exchanger: Type E-3 stainless steel welded construction.

E. Gas Burner:
   1. Sealed combustion type with adjustable combustion air supply,
   2. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
   3. Electronic pilot ignition, with electric spark igniter.
   4. Combustion air damper with synchronous spring return damper motor.
   5. Non-corrosive combustion air blower with permanently lubricated motor.

F. Gas Burner Safety Controls:
   1. Thermocouple sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
   2. Vent safety shutoff sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
   3. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.

G. Operating Controls
   1. Room Thermostat: Cycles burner to maintain room temperature setting.
   2. Supply Fan Control: Energize from bonnet temperature independent of burner controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation. Provide continuous low speed fan operation.

H. Performance:
   1. Ratings: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of ASHRAE Std 90.1; seasonal efficiency to ASHRAE Std 103.
   2. Refer to Furnace Schedule. Gas heating capacities are sea level ratings.

2.03 ROOM THERMOSTATS

A. Manufacturers:
   1. Honeywell: www.honeywell.com.
   2. Johnson Controls, Inc.: www.johnsoncontrols.com.
   3. Siemens Building Technologies, Inc.: www.sbt.siemens.com.

B. Room Thermostat: Adjustable, low voltage, to control burner operation, and supply fan to maintain temperature setting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that space is ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available.

C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

A. Install in accordance with NFPA 90A.

B. Install gas fired units in accordance with NFPA 54 and applicable codes.

C. Provide vent connections in accordance with NFPA 211.

D. Install unit heaters with vibration isolation.

E. Provide connection to electrical power systems; refer to Section 16155.

END OF SECTION

SECTION 15762

TERMINAL HEAT TRANSFER UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electric heaters.

1.02 SUBMITTALS

A. Product Data: Provide typical catalog of information including arrangements.

B. Shop Drawings:
   1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
   2. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
   3. Indicate mechanical and electrical service locations and requirements.,

C. Manufacturer's Instructions: Indicate installation instructions and recommendations.

D. Operation and Maintenance Data: Include manufacturer’s descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 10 years documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 ELECTRIC WALL HEATERS

A. Manufacturer:
   1. Markel; Model 3420/3450 series.
   2. Q-mark.
   3. Electromode.
   4. Trane.

B. Assembly: Heavy duty, wall mount, UL listed and labeled assembly with fully recessed enclosure.

C. Heating Elements: Exposed helical coil of nickel-chrome resistance wire with refractory ceramic support bushings. Heaters shall be equipped with a "zero voltage reset" thermal overload which disconnects the elements and motor in the event normal operating temperatures are exceeded.

D. Motor: Permanently lubricated, totally enclosed, shaded pole type with impedance protection..

E. Control: Built-in Thermostat or Contactor with 24v coil and heater voltage transformer for remote T-stat.

F. Electrical Characteristics:
   1. Disconnect Switch: Factory mount disconnect switch.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Do not damage equipment or finishes.

C. Protection: Provide finished cabinet units with protective covers during balance of construction.

D. Cabinet Unit Heaters: Install as indicated. Coordinate to assure correct recess size for recessed units.

E. Install electric heating equipment including devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal. Install electrical wiring in accordance with manufacturer's submittals and Section 16155.

3.02 CLEANING

A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

C. Install new filters.

END OF SECTION

SECTION 15810

DUCTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ductwork.

B. Duct cleaning.

1.02 REFERENCE STANDARDS

A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel.

B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association.

D. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association.

E. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association.

F. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 10 years of documented experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 10 years of documented experience.

1.04 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A, NFPA 90B, and NFPA 96 standards.

1.05 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

1.06 COORDINATION REQUIREMENTS

A. Sheet metal trades shall coordinate all design, construction, and installation with all other trades.

B. Sheet metal trades shall cooperate with the Test and Balance Contractor and provide all miscellaneous caps and any other materials required for structural integrity and leakage testing of the complete ductwork system. Refer to Test and Balance specification section.

C. Coordinate painting requirements of exposed ductwork in finished areas with specification section 09900 and color with Architect.

1.07 DESIGN REQUIREMENTS

A. Duct sizes shown on drawings are inside clear dimensions. For lined ducts, maintain sizes inside lining.

B. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

C. Use material, weight, thickness, gauge, construction and installation methods as outlined in the latest addition of the following SMACNA publications, unless noted otherwise:
   1. HVAC Duct Construction Standards, Metal and Flexible
   2. HVAC Air Duct Leakage Test Manual
   3. HVAC Systems - Duct Design

D. Use products which conform to NFPA 90A, possessing a flame spread rating of less than 25 and a smoke developed rating of less than 50.

1.08 PRESSURE DEFINITIONS

A. Low Pressure Ductwork: Up to 2 inches WG and velocities less than 1,500 fpm. Construct for 2 inch WG positive and negative or positive static pressures.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

A. All Ducts: Galvanized steel, unless otherwise indicated.

B. Low Pressure Supply (Heating Systems): 2 inch w.g. pressure class, galvanized steel.

C. Low Pressure Supply (System with Cooling Coils): 2 inch w.g. pressure class, galvanized steel.

D. Return and Relief: 2 inch w.g. pressure class, galvanized steel.

E. General Exhaust: 1 inch w.g. pressure class, galvanized steel.

F. Outside Air Intake: 1 inch w.g. pressure class, galvanized steel.

2.02 MATERIALS

A. General: Non-combustible ducts, conforming to Class 1 air duct materials, or UL 181.

B. Galvanized Steel Ducts: ASTM A 653/A 653M galvanized steel sheet, Forming Steel (FS) designation, with G90/Z275 zinc coating.
   1. Gaskets: Chloroprene elastomer, 40 Durometer, 1/8 inch thick, full face, one piece vulcanized or dovetail at joints.
   2. All reinforcement for ducts having a side dimension 48" or less shall be external. Internal reinforcement shall be acceptable only for ducts having a side dimension greater than 48 inches. Reinforcement shall be provided per SMACNA standards.

C. Steel Ducts - Galvanized Round and Flat Oval Spiral: Galvanized sheet steel duct and fittings, lock forming quality per ASTM A527, Coating Designation G-90, factory fabricated, lock seam or welded design in accordance with SMACNA HVAC Duct Construction Standards or SMACNA Industrial Duct Construction Standards as required based on pressure class. Flat oval and round fittings shall be factory fabricated welded design. Use of field fabricated fittings (welded design) shall only be permitted when factory fabricated fittings are unavailable.
   1. Manufacturers:
      a. Dixi-Bilt.
      b. Foremost Mfg. Co.
      c. Semco.
      d. LaPine Metal Products.
      e. United-McGill.
      f. Univarsal Spiral Air.

D. Polyvinyl Chloride Coated Steel Duct: Hot dipped galvanized steel spiral ductwork and fittings, crimp and bead at all transverse seams and standing seams for fittings. Seams shall have sealant applied to interior and exterior surfaces. Ductwork and fittings shall be prime coated on

both interior and exterior and finished with a 4 mil thick exterior and interior coat of fused polyvinyl chloride.

1. Use of field fabricated fittings shall only be permitted when factory fabricated fittings are not available.
2. All reinforcement shall be external. Internal reinforcement will not be acceptable.
3. Manufacturers:
   a. Foremost Mfg. Co. "4x4 PCD Air Duct".
   b. Dixi-Bilt.
   c. Semco.
   d. LaPine Metal Products.

E. Insulated Flexible Ducts, Low and Medium Pressure:
1. Flexible Ducts: Interlocking spiral of galvanized steel or aluminum construction or fabric supported helically wound spring steel wire or flat steel bands; rated to 6 inches WG positive and 4 inches negative for low and medium pressure ducts.
2. Insulated Flexible Ducts: Flexible duct wrapped with flexible fiber glass insulation, enclosed in a fire retardant polyethylene vapor barrier jacket; maximum 0.23 K value at 75 deg F.
3. Acoustical performance tested in accordance with the Air Diffusion Council's "Flexible Air Duct Test Code FD 72-R1."
4. Flexible Duct Fittings: Galvanized steel, twist in design with damper.
5. Manufacturer's:
   a. Flexmaster Type 8M, UL 181, Class 1.
   b. Automation Industries Thermaflex.
   c. Hart & Cooley.

F. Brazing Materials: Silicon bronze per AWS A5.6 or A5.7.

G. Welding Materials: Refer to SMACNA "Guidelines for Welding Sheet Metal."

H. Caulk: Elastomer caulk, UL listed and per NFPA 90A.

I. Zinc Paint:
1. Manufacturers:
   a. Carboline "Galvanox No. 1."
   b. Tnemec.
   c. Welco "Cold Galv."

J. Sealant: Indoor/outdoor water based duct sealant. UL listed, non-toxic, water resistant, 0 smoke/flame spread, compatible with mating materials, for use on all SMACNA seal Class A, B, and C joints, for use on 1/2 - 10" wg SMACNA pressure classes. Use PCD duct sealer on PVC coated steel ductwork.
1. Manufacturers:
   a. Hardcast "Duct-Seal #321"
   b. Foremost "PCD Duct Sealer"

K. Reinforcing and Supports:
1. Welded reinforcement and supports shall be structural steel black iron painted with zinc rich paint.
2. Screwed type and supports shall be structural steel per ASTM A36; Mill galvanized steel per ASTM A123. Fabricated sheet steel per ASTM A527, coating designation G-90.
3. Flanges in contact with the airstream shall be of the same material as the ductwork.
4. Bolts and fasteners for galvanized steel duct work shall be carbon steel, zinc coated per ASTM A153. Bolts and fasteners for stainless steel and PVC coated steel duct shall be stainless steel.

L. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.03 DUCTWORK FABRICATION

A. Low Pressure Ductwork (+/- 2 " W.G. Static Pressure Class)
   1. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

D. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
   1. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

E. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
   1. Use double nuts and lock washers on threaded rod supports.
   2. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Install in accordance with manufacturer's instructions.

C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

D. Flexible Ducts: Connect to metal ducts with liquid adhesive plus tape.

E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

F. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

G. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

H. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

I. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

J. Use double nuts and lock washers on threaded rod supports.

K. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

L. At exterior wall louvers, seal duct to louver frame.

M. Provide flexible duct connections where ductwork connects to fans, air handling equipment, and other rotating equipment and/or where indicated on the drawings.

N. Provide straight runs of ductwork at fans, coils, air terminal units, and other equipment per

manufacturer's recommendations.

O. Where ducts pass through fire rated walls or floor dividing conditioned spaces from unconditioned spaces, provide a flanged duct-segment for installation during the time of construction to provide a tight seal.

P. Where ducts pass through walls and floors, finish wall openings with metal trim strips and curb floor openings. Wood frames are not permitted.

Q. Install airfoil turning vanes in all rectangular mitered elbows, whether indicated on drawings or not.

R. Tape joints of PVC coated metal ductwork with PVC tape.

3.02 DUCTWORK FABRICATION

A. Verify dimensions at the site, making field measurements and drawings necessary for fabrication and erection. Check plans showing work of other trades and consult with Architect and/or Engineer in the event of any interferences.

B. Fabricate necessary offsets and transitions to avoid interference with building construction, piping, equipment, etc. Make changes, offsets, etc. for duct obstructions per SMACNA HVAC Duct Construction Standards or SMACNA Industrial Duct Construction Standards as required based upon pressure class. However, do not reduce duct to less than 6 inches in any dimension and do not exceed an 8:1 aspect ratio. Where it is necessary to take pipes, beams, or other similar obstructions through ducts, construct easement as indicated in SMACNA HVAC Duct Construction Standards or SMACNA Industrial Duct Construction Standards. In all cases, seal to prevent air leakage.

C. Fabricate ductwork to prevent failure under pressure or vacuum created by fast closure of ductwork devices. Provide leaktight automatic relief devices where required.

D. Ducts or plenums of masonry construction are not acceptable.

E. Repair galvanized surfaces damaged by the application of zinc rich paint per manufacturer's instructions.

3.03 DUCT LEAKAGE

A. The maximum allowable total leakage rate for duct systems shall be 5% of their associated fan and/or air handling unit CFM.

3.04 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.05 PAINTING

A. All ductwork exposed in finished areas (insulated and/or uninsulated) shall be painted to match the surrounding finishes. Refer to specification section 09900 - Coordinate color with Architect.

END OF SECTION

SECTION 15820

DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air turning devices/extractors.

B. Backdraft dampers.

C. Duct access doors.

D. Duct test holes.

E. Flexible duct connections.

F. Volume control dampers.

1.02 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association.

B. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.

C. UL 33 - Heat Responsive Links for Fire-Protection Service; Underwriters Laboratories Inc..

D. UL 555 - Standard for Fire Dampers; Underwriters Laboratories Inc..

1.03 PROJECT RECORD DOCUMENTS

A. Record actual locations of access doors and test holes.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 10 years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Manufacturers:
   1. Krueger: www.krueger-hvac.com.
   2. Ruskin Company: www.ruskin.com.
   3. Titus: www.titus-hvac.com.
   4. Nailor.

B. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

2.02 BACKDRAFT DAMPERS

A. Manufacturers:
   1. Louvers & Dampers, Inc.: www.louvers-dampers.com.

2. Nailor Industries Inc.: www.nailor.com.
3. Ruskin Company: www.ruskin.com.
4. Greenheck.
5. Air Balance Inc.

B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: galvanized steel or extruded aluminum, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.03 DUCT ACCESS DOORS

A. Manufacturers:
1. Nailor Industries Inc.: www.nailor.com.
2. Ruskin Company: www.ruskin.com.
3. SEMCO Incorporated: www.semcoinc.com.
4. Air Balance Inc..

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Access doors with sheet metal screw fasteners are not acceptable.

D. Provide access doors at all fire dampers, control dampers, and all temperature control equipment.

E. Provide kitchen exhaust ductwork access openings and doors per NFPA - 96.

2.04 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.05 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.
1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz. per sq. yd.
   a. Net Fabric Width: Approximately 3 inches wide.
2. Metal: 3 inches wide, 24 gage thick galvanized steel.

C. Manufacturers:
1. Ventfabrics, Inc. "Ventglas."
2. Pathway.
3. Duro-Dyne.

2.06 VOLUME CONTROL DAMPERS

A. Manufacturers:
1. Louvers & Dampers, Inc.: www.louvers-dampers.com.
2. Nailor Industries Inc.: www.nailor.com.
3. Ruskin Company: www.ruskin.com.
4. American Warming and Ventilating Inc.
5. Greenheck.
6. NCA Manufacturing.
7. Air Balance Inc.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible,

and as indicated.

C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

E. End Bearings: Except in round ducts 6 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearing.

F. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
   3. Where rod lengths exceed 30 inches provide regulator at both ends.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 15810 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at ends of all main duct runs for future duct cleaning, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access and duct cleaning, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

F. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

G. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

H. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 15835

POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cabinet exhaust fans.

B. Ceiling exhaust fans.

1.02 REFERENCE STANDARDS

A. AMCA 99 - Standards Handbook; Air Movement and Control Association International, Inc..

B. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating; Air Movement and Control Association International, Inc. (ANSI/AMCA 210, same as ANSI/ASHRAE 51).

C. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc..

D. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; Air Movement and Control Association International, Inc..

E. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc..

F. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association.

G. UL 705 - Power Ventilators; Underwriters Laboratories Inc..

1.03 SUBMITTALS

A. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

B. Manufacturer's Instructions: Indicate installation instructions.

C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 10 years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 EXTRA MATERIALS

A. Supply two sets of belts for each fan.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Greenheck: www.greenheck.com.

B. Loren Cook Company: www.lorencook.com.

C. PennBarry: www.pennbarry.com.

D. ACME Engineering and Manufacturing Corporation: www.acmefan.com.

E. Carnes Company.

2.02 POWER VENTILATORS - GENERAL

A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.

C. Fabrication: Conform to AMCA 99.

D. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.03 CABINET AND CEILING EXHAUST FANS

A. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.

B. Disconnect Switch: Cord and plug in housing for thermal overload protected motor.

C. Grille: Aluminum with baked white enamel finish.

D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Hung Cabinet Fans:
   1. Install flexible connections specified in Section 15820 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

C. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

END OF SECTION

SECTION 15850

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers.

B. Registers/grilles.

1.02 REFERENCE STANDARDS

A. ADC 1062: GRD - Test Code for Grilles, Registers & Diffusers; Air Diffusion Council.

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc..

C. ASHRAE Std 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc..

1.03 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, make, model, finish, location, air quantity, pressure drop, neck or jet velocity, throw, diffusion range, and noise level.
   1. Throw shall be the horizontal distance from the diffuser to the point where the theoretical centerline velocity is 50 feet per minute. The throw scheduled shall not exceed the horizontal distance between the diffuser and the nearest wall, or half the distance between ceiling diffusers.
   2. Identify diffusers using the designations used in the drawings and specifications.
   3. Sound data shall be given in terms of sound power level in octave bands 2 through 8, and NC index for the capacity range of the diffuser.

B. Project Record Documents: Record actual locations of air outlets and inlets.

1.04 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 10 years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carnes Company HVAC: www.carnes.com.

B. Krueger: www.krueger-hvac.com.

C. Price Industries: www.price-hvac.com.

D. Titus: www.titus-hvac.com.

E. Nailor.

F. Tuttle & Bailey.

2.02 DIFFUSERS, REGISTERS, AND GRILLS - GENERAL

A. Refer to schedules on drawings for quantities, types, finishes, and manufacturers' model numbers of diffusion devices.

B. Air diffusion devices have been chosen in terms of specific air distribution requirements, spacing, and sound characteristics. Provide ADC certified manufacturer's standard devices.

C. Provide plaster frames for diffusers installed in plaster ceilings.

D. Install wall mounted supply registers six (6) inches below ceiling, unless noted otherwise.

E. Diffusers shall be standard off-white baked enamel finish, unless noted otherwise. Contractors shall coordinate diffuser colors with architect prior to ordering. Provide air diffusion device interior surfaces, including blank-offs, with black matte finish.

F. Coordinate frame types with architectural reflected ceiling plan.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09900.

END OF SECTION

SECTION 15950

TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

1.02 REFERENCE STANDARDS

A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council.

B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc..

C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau.

1.03 SUBMITTALS

A. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

B. Sample Report Forms: Submit two sets of sample TAB report forms.

C. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

D. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

E. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.
   2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for ENGINEER and for inclusion in operating and maintenance manuals.
   3. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
   4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   6. Units of Measure: Report data in I-P (inch-pound) units only.
   7. Test Reports: Indicate data on AABC MN-1 forms, NEBB forms, or forms containing information indicated in Schedules.
   8. Include the following on the title page of each report:
      a. Name of Testing, Adjusting, and Balancing Agency.
      b. Address of Testing, Adjusting, and Balancing Agency.
      c. Telephone number of Testing, Adjusting, and Balancing Agency.
      d. Project name.
      e. Project location.
      f. Project ENGINEER.

g. Project Engineer.
h. Project CONTRACTOR.
i. Project altitude.
j. Report date.

F. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
1. AABC MN-1, AABC National Standards for Total System Balance.
2. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
3. Maintain at least one copy of the standard to be used at project site at all times.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
2. Having minimum of five years documented experience.
3. Certified by one of the following:
a. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.
b. NEBB, National Environmental Balancing Bureau: www.nebb.org.
4. And/Or one of the following Pre-Qualified TAB Agencies.

E. Pre-Qualified TAB Agencies:
1. Integrity Test & Balance: 11448 Ramblewood Dr., Cedar, MI 49621, (231-929-0940) - Contact Kevin Heikkila (cell: 231-499-5666)..
2. International Test & Balance Inc. - Southfield, MI (248-559-5864).
3. Absolut Balance Company, Inc. - South Lyon, MI.
4. Great Lakes Balancing - Grand Rapids, MI (616-949-8331).
5. Enviro-Aire/Total Balance Co. - St. Clair Shores, MI.
6. Hi-Tech Test & Balance - Freeland, MI (989-695-5498).
7. Technical Energy Solutions - Byron Center, MI (616-583-6000)

3.02 SEQUENCING AND SCHEDULING

A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

B. The mechanical contractor shall provide to the TAB sub-contractor all shop drawings, submittal data, up-to-date revisions, change orders, bulletins, and other data required for the planning, preparation, and execution of the TAB work.

C. The mechanical contractor shall provide startup personnel to assist the TAB sub-contractor in testing, adjusting, and balancing work.

D. Schedule and provide assistance in final adjustment and test of the kitchen exhaust and make-up air systems with Health Department.

E. If testing, adjusting, and balancing of a mechanical system cannot take place due to seasonal

weather, all parties involved (i.e. mechanical contractor and test/balance agency) shall return to the site during season required to properly test, adjust and balance the equipment. An example of this would be a heating system installed and tested in the cooling season (summer). Due to the fact that there may not be enough heating load required to properly test and balance the heating systems, all parties shall return to the site the following heating season (winter) to test, adjust, and balance the heating system.

F. All test points, balance valves, mechanical identification, etc. shall be complete and accessible to the TAB sub-contractor.

G. Schedule and provide assistance in final adjustment and test of life safety system, smoke evacuation system, and smoke control system with Fire Authority.

3.03 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage is minimized.
   12. Pumps are rotating correctly.
   13. Proper strainer baskets are clean and in place.
   14. Service and balance valves are open.

B. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

C. Examine system and equipment test reports.

D. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

E. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

F. Examine equipment for installation and for properly operating safety interlocks and controls.

G. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

H. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

I. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.

J. Beginning of work means acceptance of existing conditions.

3.04 PREPARATION

A. Hold a pre-balancing meeting 4 weeks prior to starting TAB work.
   1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to ENGINEER to facilitate spot checks during testing.

C. Provide additional balancing devices as required.

D. Prepare a TAB plan that includes strategies and step-by-step procedures.

E. Perform the following field tests and inspections to new and renovated portions of duct systems according to SMACNA's "HVAC Air Duct Leakage Test Manual" and prepare test reports:
   1. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
   2. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.
   3. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round and flat-oval ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (both positive and negative pressures), and Leakage Class 6 for pressure classes from 2- to 10-inch wg.
   4. Remake leaking joints and retest until leakage is equal to or less than maximum allowable.

F. Complete system readiness checks and prepare system readiness reports. Verify the following:
   1. Permanent electrical power wiring is complete.
   2. Equipment and duct access doors are securely closed.
   3. Balance, smoke, and fire dampers are open.
   4. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
   5. Windows and doors can be closed so indicated conditions for system operations can be met.

3.05 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.06 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the OWNER.

F. Check and adjust systems approximately six months after final acceptance and submit report.

3.07 AIR SYSTEM PROCEDURE

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts, or use reduced scale contract documents with notations.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

E. Cut insulation, and drill ducts for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes with neat patches, neoprene plugs, threaded plugs, or threaded twist-on metal caps, and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

F. Check air flow within intake plenums and mixing boxes of air handling units for uneven flow and temperature stratification and prepare a report with profile elevations (temperature and velocity) on each coil or filter face for Architect.

G. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

H. Verify that motor starters are equipped with properly sized thermal protection.

I. Check dampers for proper position to achieve desired airflow path.

J. Check for airflow blockages.

K. Check for proper sealing of air duct system.

L. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.

M. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

N. Measure air quantities at air inlets and outlets.

O. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

P. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

Q. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

R. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

S. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

T. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

U. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

V. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

3.08 PROCEDURES FOR CONSTANT VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
   1. Measure fan static pressures to determine actual static pressure as follows:

a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
b. Measure static pressure directly at the fan outlet.
c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
   a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
4. Select required sheave sizes and advise installing contractor to change drive sheaves accordingly.
5. Do not recommend fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
   1. Measure airflow at a point downstream from the balancing damper and adjust volume dampers until the proper airflow is achieved.
      a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
   2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.
   1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.
   1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
   2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.09 INSPECTIONS

A. Initial Inspection:
   1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
   2. Randomly check the following for each system:
      a. Measure airflow of at least 10 percent of air outlets.
      b. Measure space pressure of at least 10 percent of locations.
      c. Verify that balancing devices are marked with final balance position.
      d. Note deviations to the Contract Documents in the Final Report.

B. Final Inspection:
   1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final

inspection be made by Owner.
2. TAB firm test and balance engineer shall conduct the inspection in the presence of Owner.
3. Owner shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

3.10 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

3.11 SCOPE

A. Test, adjust, and balance the following:
   1. Forced Air Furnaces
   2. Air Coils
   3. Fans
   4. Air Inlets and Outlets
   5. Heat/Energy Recovery Ventilators

3.12 MINIMUM DATA TO BE REPORTED

A. Items:
   1. Fan Data:
      a. System identification.
      b. Location.
      c. Make and type.
      d. Model number and size.
      e. Manufacturer's serial number.
      f. Arrangement and class.
      g. Sheave make, size in inches, and bore.
      h. Sheave dimensions, center-to-center, and amount of adjustments in inches.
   2. Electric Motors:
      a. Manufacturer
      b. Model/Frame
      c. HP/BHP
      d. Phase, voltage, amperage; nameplate, actual, no load
      e. RPM
      f. Service factor
      g. Starter size, rating, heater elements
      h. Sheave Make/Size/Bore
   3. V-Belt Drives:
      a. Identification/location
      b. Required driven RPM
      c. Driven sheave, diameter and RPM
      d. Belt, size and quantity

   e. Motor sheave diameter and RPM
   f. Center to center distance, maximum, minimum, and actual
4. Cooling Coils:
   a. Identification/number
   b. Location
   c. Service
   d. Manufacturer
   e. Air flow, design and actual
   f. Entering air DB temperature, design and actual
   g. Entering air WB temperature, design and actual
   h. Leaving air DB temperature, design and actual
   i. Leaving air WB temperature, design and actual
   j. Water flow, design and actual
   k. Water pressure drop, design and actual
   l. Entering water temperature, design and actual
   m. Leaving water temperature, design and actual
   n. Saturated suction temperature, design and actual
   o. Air pressure drop, design and actual
5. Heating Coils:
   a. Identification/number
   b. Location
   c. Service
   d. Manufacturer
   e. Air flow, design and actual
   f. Entering air temperature, design and actual
   g. Leaving air temperature, design and actual
   h. Air pressure drop, design and actual
6. Air Moving Equipment:
   a. Location
   b. Manufacturer
   c. Model number
   d. Serial number
   e. Arrangement/Class/Discharge
   f. Air flow, specified and actual
   g. Return air flow, specified and actual
   h. Outside air flow, specified and actual
   i. Total static pressure (total external), specified and actual
   j. Inlet pressure
   k. Discharge pressure
   l. Sheave Make/Size/Bore
   m. Number of Belts/Make/Size
   n. Fan RPM
7. Return Air/Outside Air:
   a. Identification/location
   b. Design air flow
   c. Actual air flow
   d. Design return air flow
   e. Actual return air flow
   f. Design outside air flow
   g. Actual outside air flow
   h. Return air temperature
   i. Outside air temperature
   j. Required mixed air temperature
   k. Actual mixed air temperature
   l. Design outside/return air ratio
   m. Actual outside/return air ratio

8. Heat/Energy Recovery Ventilators:
    a. Location
    b. Manufacturer
    c. Model number
    d. Serial number
    e. Air flow, specified and actual
    f. Total static pressure (total external), specified and actual
    g. Inlet pressure
    h. Discharge pressure
    i. Sheave Make/Size/Bore
    j. Number of Belts/Make/Size
    k. Fan RPM
    l. Summer Conditions: Outdoor Air Temperature, Return Air Temperature, Supply Air Temperature, Exhaust Air Temperature
    m. Winter Conditions: Outdoor Air Temperature, Return Air Temperature, Supply Air Temperature, Exhaust Air Temperature
9. Exhaust Fans:
    a. Location
    b. Manufacturer
    c. Model number
    d. Serial number
    e. Air flow, specified and actual
    f. Total static pressure (total external), specified and actual
    g. Inlet pressure
    h. Discharge pressure
    i. Sheave Make/Size/Bore
    j. Number of Belts/Make/Size
    k. Fan RPM
10. Duct Leak Tests:
    a. Description of ductwork under test
    b. Duct design operating pressure
    c. Duct design test static pressure
    d. Duct capacity, air flow
    e. Maximum allowable leakage duct capacity times leak factor
    f. Test apparatus
        1) Blower
        2) Orifice, tube size
        3) Orifice size
        4) Calibrated
    g. Test static pressure
    h. Test orifice differential pressure
    i. Leakage
11. Air Distribution Tests (diffusers, grills, registers):
    a. Air terminal number
    b. Room number/location
    c. Terminal type
    d. Terminal size
    e. Area factor
    f. Design velocity
    g. Design air flow
    h. Test (final) velocity
    i. Test (final) air flow
    j. Percent of design air flow

END OF SECTION

SECTION 16010

GENERAL ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This Division includes all labor, materials, equipment, tools, supervision, start-up services, Owner's Instructions, including all incidental and related items necessary to complete installation and successfully test and start up and operate the Electrical Systems indicated on Drawings and described in each Section of Division 16 Specifications and conforming with ALL other Contract Documents.

B. The Drawings and General Provisions of the Contract, including the General Conditions, Supplementary General Conditions, and Division 1 specification sections, apply to work of Division 16 sections. The items in this section are not intended to supersede, but are supplementary to, the requirements set forth in other Divisions of the specifications.

1.02 DRAWINGS & SPECIFICATIONS

A. The drawings are diagrammatic and show the general location and arrangement of equipment, outlets, lights and related electrical items. They shall be followed as closely as elements of the construction will permit.

B. The general electrical requirements are intended to augment the drawings and specifications. Should conflicts occur between the drawings and the specifications, the strictest provision shall govern. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the ARCHITECT and/or ENGINEER for resolution.

C. The CONTRACTOR shall examine the drawings of all other trades in order to verify the conditions governing the work on the job site. Arrange work accordingly, providing all wiring, conduit, fittings, boxes, etc. as may be required to meet such conditions.

D. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the ARCHITECT and/or ENGINEER.

E. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the ARCHITECT and/or ENGINEER for resolution.

1.03 COORDINATION OF WORK

A. The CONTRACTOR shall verify clearance requirements of all electrical and mechanical equipment/systems prior to the installation of any new work. Electrical equipment, wiring, systems, etc. shall not interfere with mechanical equipment spaces. The CONTRACTOR shall coordinate his work to obtain symmetry in ceiling layouts, so that sprinkler heads, lights, diffusers, etc. are coordinated and are installed per the Architectural reflected ceiling plan.

B. The CONTRACTOR and his Subcontractors shall be responsible for all tasks applicable to their work in accordance with the Specifications, Drawings, and code requirements, and shall be responsible for coordinating locations and arrangements of their work to give best results with all other relevant trades.
   1. Coordinate his work to obtain symmetry in ceiling layouts, so that sprinkler heads, lights, diffusers, etc. are coordinated and are installed per the Architectural reflected ceiling plan.
   2. Coordinate all wall, roof, floor penetrations, equipment pads, equipment locations, system routings, etc. with architectural and structural trades.

3. Verify requirements of all equipment with shop drawing submittals prior to installation - notify Architect/Engineer of any conflicts between shop drawings and plans.
4. Coordinate rough-in locations and mounting heights of all devices with locations/heights of countertops/sinks/furniture/cabinets/etc. with Architectural Elevations and other trades prior to rough-in.
5. Coordinate rough-in locations of mechanical control devices (i.e. thermostats, sensors, etc.) with mechanical trades. T-stats shall be located @ 48" AFF unless noted otherwise.
6. Coordinate locations of electrical items that require access (i.e. panelboards, starters, pull boxes, etc.) with reflected ceiling plan. Items located above hard non-accessible ceilings shall be provided with access doors as required.
7. Do not route/locate below grade conduit/circuits below, or with 45 degrees of the bottom corner of, foundation walls/footings. Coordinate with structural trades prior to rough-in.
8. Verify clearance requirements of all electrical and mechanical equipment/systems prior to the installation of any new work. Mechanical/Plumbing equipment, piping, ductwork, systems, etc. shall not interfere with electrical equipment spaces. Electrical conduit and equipment clearances shall not interfere with mechanical equipment spaces.

1.04 INSPECTION OF SITE AND PROJECT DOCUMENTATION

A. The CONTRACTOR shall visit the site and examine/verify the conditions under which the work must be conducted before submitting proposal. The CONTRACTOR shall examine the drawings and specifications of all other trades including Mechanical, Architectural, Structural and Electrical.

B. The submitting of a proposal implies that the CONTRACTOR has visited the site, examined all contract documents, and understands the conditions under which the work must be conducted.

C. The CONTRACTOR shall notify the ARCHITECT and/or ENGINEER, via written RFI prior to submitting his bid, of any potential conflicts/problems with the plans that he has identified during his inspection of the site and/or from the review of plans/specifications.

1.05 GENERAL SUPPORT REQUIREMENTS

A. Provide all necessary angle/brackets or supplementary steel as required for adequate support for all conduit, lighting, specialties, and equipment. Secure approval from Architect and/or Structural Engineer, in writing, before welding or bolting to steel framing or anchoring to concrete structure, or cutting/coring thru structural systems.

B. Where conduit or equipment is supported or suspended from concrete construction, provide approved concrete inserts in formwork to receive hanger rods, such as Unistrut or Powerstrut, and where installed in metal deck, use Ramset or Welds as required.

1.06 GUARANTEE

A. CONTRACTOR shall guarantee that all labor, materials, and equipment are free from defects and agrees to replace or repair any part of this installation which becomes defective within a period of one year from the date of substantial completion following final acceptance, provided that such failure is due to defects in the equipment, material or installation. Acceptance date of substantial completion shall be OWNER occupancy as determined by the ARCHITECT and/or ENGINEER.

B. The CONTRACTOR shall file with the OWNER one set of guarantees from the equipment manufacturers including the operating conditions and performance capacities they are based on.

C. Refer to General Conditions for any other guarantee requirements.

1.07 CODES, PERMITS AND FEES

A. Refer to Division 1, General Requirements and Supplementary Conditions.

B. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for electrical work shall be secured and paid for by the CONTRACTOR.

C. All work shall be executed in accordance with the rules and regulations set forth in local and state

codes. Prepare any detailed drawings or diagrams which may be required by the governing authorities.

D. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern. In the event that the plans and specifications conflict with any rules, regulations, or codes applying, said rules, regulations and codes shall govern.

1.08 UTILITIES

A. Rules of local utility companies shall be complied with. The CONTRACTOR shall check with each utility company supplying service to the installation (i.e. power, phone, data, cable) and coordinate service requirements including, but not limited to, all transformers, meter boxes and meters which will be required. The Contractor shall coordinate all utilities with the utility providers. The Owner shall pay for all required utility costs.

B. In the event that the plans and specifications conflict with any utility rules applying, said utility rules and regulations shall govern

1.09 SUBSTITUTION ITEMS REQUIRING PRIOR APPROVAL

A. All items that the CONTRACTOR proposes to use in the work, that are not specifically named in the contract documents, must be submitted for review/approval. Such items must be submitted to the ARCHITECT and/or ENGINEER for approval a minimum of ten (10) days prior to bid opening. Requests for prior approval must be accompanied by complete catalog information, including but not limited to, model, size, accessories, complete electrical information and performance data in the form given in the equipment schedule on the drawings at stated design conditions. Where items are referred to by symbolic designations on the drawings, all requests for prior approval shall bear the same designations.

B. Lighting Substitutions:
   1. Furnish lighting fixtures as scheduled on drawings.
   2. Lighting fixture substitutions may be considered for approval by the ARCHITECT and/or ENGINEER only if all of the following criteria are met:
      a. Provide specification cut sheets marked-up to clearly identify the proposed luminaire including features, options, accessories, etc. required to match products indicated in the schedules.
      b. Submit all cut sheets, calculations, etc. to the ARCHITECT and/or ENGINEER no less than 10 days prior to bid date. Substitutions submitted after this date will not be considered.

1.10 MATERIAL AND EQUIPMENT MANUFACTURERS

A. All items of equipment shall be furnished complete with all accessories normally supplied with the catalog items listed and all other accessories necessary for a complete and satisfactory operating system. All equipment and materials shall be new and shall be standard products of manufacturers regularly engaged in the production of electrical equipment and shall be the manufacturer's latest design.

B. If equipment by an approved manufacturer is other than the equipment specified as the basis of design the substituted equipment shall be equal in quality, durability, appearance, capacity and efficiency through all ranges of operation, shall conform with arrangements and space limitations of the equipment shown on the plans and/or specified, shall be compatible with the other components of the system and shall comply with the requirements for Substitution Items Requiring Prior Approval specified in this Section of the Specifications. All costs to make these items of equipment comply with original requirements including, but not limited to, conduit, wiring, bus work, enclosures, and building alterations shall be included in the original bid.

1.11 OPERATION AND MAINTENANCE INSTRUCTIONAL MANUALS

A. Provide compete maintenance and operating instructional manuals covering all electrical

equipment as specified herein, and individual equipment specification sections.

B. The O&M data shall be bound in a suitable number of 3" or 4", 3-ring, hard cover binders. Permanently imprinted on the cover shall be the words, "Manufacturer's Operation and Maintenance Data", project title, location of project, and the date. A table of contents shall be provided in the front of each binder.

C. Maintenance and operating instructional manuals shall be job specific to this project. Generic manuals are not acceptable. Each piece of equipment in the O&M manual shall be identified as identified on the project drawings (i.e. Transformer T-1, Distribution Panel DP-1, etc.).

D. Internally subdivide the binder contents with permanent page dividers, organized by major equipment/systems (i.e. Distribution Equipment, Wiring Devices, Lighting Fixtures, Lighting Controls, etc.)

E. Contents: Each volume of O&M manual shall have three parts:
   1. Part 1: A directory listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: O&M data, arranged and subdivided by major equipment/systems. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers:
      a. List of equipment.
      b. Installation and operational procedures.
      c. Routine maintenance procedures.
      d. Trouble shooting procedures.
      e. Complete parts lists by nomenclature, manufacturer's part number and use.
      f. Recommended spare parts lists.
      g. Lubrication chart listing all types of lubricants to be used for each piece of equipment and the recommended frequency of lubrication.
      h. Complete wiring and schematic diagrams.
      i. Elevations and/or sections cut through all of the major equipment and sub-assemblies.
   3. Part 3: Project documents and certificates, including the following: Shop drawings.
      a. Shop drawings and product data.
      b. Warranty certificates.
      c. Copies of approved construction permits.
      d. CONTRACTOR's and equipment manufacturer's telephone numbers for warranty repair services.

F. Two (2) Maintenance and Operating manuals shall be provided to the ARCHITECT and/or ENGINEER for review when construction is 75% complete.

G. A minimum of two (2) copies of all approved Operation and Maintenance literature shall be furnished to the OWNER within 10 days after final inspection. O&M manuals must be completed prior to start of OWNER training as the manuals shall be used as the basis of the training.

1.12 SHOP DRAWINGS

A. Refer to General Conditions and Supplementary General Conditions.

B. All shop drawings shall be submitted in groupings of similar and/or related items. Incomplete submittal groupings will be returned unchecked.

C. Submit six (6) copies of complete manufacturer's shop drawings for all electrical equipment, or systems, including but not limited to, the items listed below. Where items are referred to by symbolic designation on the drawings and specifications, all submittals shall bear the same designation. Refer to other Sections of the electrical specifications for additional requirements.
   1. Panelboards
   3. Disconnect Switches
   4. Wiring Devices
   5. Lighting Fixtures

6. Lighting Controllers

1.13 INSTRUCTION OF OWNER PERSONNEL

A. Before final inspection the CONTRACTOR shall instruct OWNER's designated personnel in operation, adjustment and maintenance of electrical equipment and systems at agreed upon times. A minimum of 8 hours of formal instruction to OWNER's personnel shall be provided for each building. Additional hours are specified in individual specifications sections.

B. Use Operation and Maintenance Manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

C. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

1.14 RECORD DRAWINGS

A. CONTRACTOR shall submit to the ARCHITECT and/or ENGINEER, record drawings which have been neatly marked to represent as-built conditions for all new electrical work.

B. The CONTRACTOR shall keep accurate note of all deviations from the construction documents and discrepancies in the concealed conditions and other items of construction on field drawings as they occur. Proper circuiting, conduit runs, location and number of electrical devices shall be indicated on the "as-built" drawings. The marked up field documents shall be available for review by the ARCHITECT, ENGINEER and OWNER at their request.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 INSTALLATION OF EQUIPMENT

A. Install equipment in strict accordance with all directions and recommendations furnished by the manufacturer. Where such directions are in conflict with the drawings and specifications, report such conflicts to the ARCHITECT and/or ENGINEER for resolution prior to installation.

3.02 CHASE, SHAFTS AND RECESSES

A. Coordinate with architectural and other trades to ensure accurate location and size of chases, shafts and recesses.

3.03 CUTTING, CORING AND PATCHING

A. Refer to General Conditions

B. All cutting, coring, patching and repair work shall be performed by the CONTRACTOR through approved, qualified Subcontractors. CONTRACTOR shall include full cost of same in his bid.

3.04 EXCAVATION AND BACKFILLING

A. Provide all excavation, trenching, tunneling and backfilling required for the electrical work.

B. Where conduit is installed less than 2'6" below the surface of pavement, provide concrete encasement, 4" minimum coverage, all around or as shown on the electrical drawings.

C. Install warning tape for all buried circuits.

D. Refer to Architectural, Structural, and Site/Civil Specification sections for excavation and backfilling details.

3.05 EQUIPMENT FOUNDATIONS AND SUPPORTS

A. Shall be as required for equipment mounting or as shown on plans.

B. For equipment suspended from ceiling or walls, furnish and install all inserts, rods, structural steel frames, brackets and platforms required. Obtain approval of ARCHITECT and/or STRUCTURAL ENGINEER for same including loads, locations, and methods of attachment.

3.06 SLEEVES

A. Provide and install Schedule 40 black steel pipe sleeves, cut to length, wherever conduits pass through above grade walls and floors. Provide and install galvanized steel pipe sleeves, cut to length, wherever conduits pass through below grade foundation walls and slab on grade floors. Sleeves shall terminate flush with walls in finished areas. All sleeves through the floor are to extend two (2) inches above finish floor.

B. Provide escutcheons at each penetration through walls, floors, and ceilings in exposed areas.

C. Patch sleeves to match building material.

3.07 SEALING OF ELECTRICAL OPENINGS

A. Seal the space around conduits in sleeves through walls, floors and ceilings.

B. Provide adequate clearance to allow for proper sealing.

C. Provide/install fireproof wall and floor sleeves as required at all applicable wall, ceiling, and floor penetrations. Refer to Architectural plans for wall assembly ratings.

D. Sleeves placed in floors shall be flush with the underside of the floor construction and shall have planed, square ends, extending 2 inches above the finished floor, unless otherwise noted or detailed.

E. Where sleeves pass through reinforced concrete floors, they shall be properly set in position prior to concrete pouring in such a way that they will be maintained in position until the concrete is set.

F. Conduits passing through below grade perimeter walls or slabs on grade shall have the space between the pipe and sleeve sealed watertight with a mechanically expandable elastomer seal device.

3.08 FIRESTOP MATERIALS

A. Use only firestop products that have been tested according to ASTM E-814 and UL 1479 for the conditions set forth regarding construction assembly type, penetrating item type, annular space requirements and fire rating.

B. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in other related specification sections.
   1. For non-combustible penetrations including conduit not passing through a sleeve, the following materials are acceptable:
      a. Hilti FS 601 Elastmeric Firestop Sealant.
      b. 3 M.
      c. CSD Sealing Systems.
      d. Firestop Systems.
   2. For non-combustible penetrations including sleeved conduits, the following materials are acceptable:
      a. Hilti FS 601 Elastmeric Firestop Sealant.
      b. 3 M.
      c. CSD Sealing Systems.
      d. Firestop Systems.
   3. For combustible penetrations including cables and cable bundles, the following materials are acceptable:
      a. Hilti FS 611A Intumescent Firestop Sealant.
      b. 3 M.
      c. CSD Sealing Systems.
      d. Firestop Systems.

4. For large or complex penetrations involving multiple conduits, cable trays, electrical bussway, etc. the following materials are acceptable:
   a. Hilti FS 635 Firestop Compound.
   b. 3 M.
   c. CSD Sealing Systems.
   d. International Protective Coatings - KBS Sealbags.

3.09 EQUIPMENT CONNECTIONS

A. Make connections to equipment, fixtures and other items included in the work in accordance with the approved shop drawings and rough-in measurements furnished by the manufactures of the particular equipment furnished. All additional connections not shown on the drawings, but called out by the equipment manufacturer's shop drawings, shall be provided at no additional cost.

3.10 CLEANING

A. Each Trade shall be responsible for removing all debris daily as required to maintain the work area in a neat, orderly condition.

B. Final cleanup shall include, but not be limited to, washing of fixture lenses or louvers, switchboards, substations, motor control centers, panels, etc. Fixture reflectors and lenses or louvers shall be left with no water marks or cleaning streaks.

3.11 HAZARDOUS/CLASSIFIED LOCATIONS

A. Explosion-Proof Rated Areas: All electrical systems (i.e. conduit, fittings, circuits, devices, equipment, etc.) installed in classified areas shall be installed as required by NEC and applicable NFPA rules. Sealing fittings shall be properly installed at all required locations in accordance with code regulations. Automatic drain conduit seals shall be used wherever necessary to ensure the prevention of moisture accumulation. Approved breathers shall be installed in appropriate locations.

3.12 PAINTING

A. All electrical systems, equipment, conduit, etc. exposed in finished areas shall be painted to match the surrounding finishes. Refer to specification section 09900 - Coordinate color with Architect

3.13 PROTECTION AND HANDLING OF EQUIPMENT AND MATERIALS

A. Equipment and materials shall be protected from theft, injury or damage.

B. Protect equipment outlets, pipe and duct openings with temporary plugs or caps.

C. Provide adequate storage for all equipment and materials delivered to the job site. Equipment set in place in unprotected areas must be provided with temporary protection.

3.14 ACCESS DOORS

A. The CONTRACTOR, and/or his Subcontractors, shall provide access doors for access to any of their respective electrical equipment that is installed in inaccessible areas. Provide access doors in the walls, as required to make all electrical boxes, controls and other equipment installed by the CONTRACTOR accessible. In the walls, provide Milcor No. "DW" or "M" as required to make all equipment installed by the CONTRACTOR accessible. Minimum size 12 inches x 12 inches. In the ceiling, provide Milcor N. 3210, 3105 or 3206 for accessibility as mentioned above, 24 inches x 24 inches minimum size. The plaster or acoustical tile insert shall be by the architectural trades. Areas with accessible ceilings (ceilings where tiles are not fastened in place and can be individually removed without removal of adjacent tiles) will not require access doors.

B. Refer to Architectural specifications for manufacturer's and model numbers and additional information.

C. The CONTRACTOR, and/or his Subcontractors, shall be responsible for quantities of access

doors and shall receive approval for locations from the ARCHITECT and/or ENGINEER prior to installation.

D. The CONTRACTOR, and/or his Subcontractors, shall purchase appropriate access doors, coordinate locations, and shall pay for installation by a qualified architectural subcontractor.

E. When access doors are in fire resistant walls or ceilings, they must bear the Underwriters' Laboratories, Inc., Label, with time design rating equal to or exceeding that of the wall or ceiling unless they were a part of the tested assembly.

3.15 NAMEPLATES AND DIRECTORIES

A. Identify switchgear, unit substations, motor controls, panelboards, safety switches, etc., with manufacturer's nameplate, shop order, where applicable on composite assemblies, and designations used on the Drawings. Nameplates shall be laminated phenolic plastic, beveled edged white with engraved black letters. Except where impractical, letter and numerals shall be a minimum of 1/2 inch high. Nameplates shall be mechanically secured. Pressure sensitive nameplates are not acceptable. Panel directories shall be neatly typed, showing equipment served and location for each breaker or switch with a clear plastic protective cover.

3.16 EXTRA WORK

A. For any extra electrical work which may be proposed, the Electrical Contractor shall furnish to the General Contractor/Construction Manager, an itemized breakdown of the estimated cost of all materials and labor required to complete this work. The estimate cost breakdown shall include unit prices (same prices for increase/decrease of work) for all materials (i.e. wire, conduit, devices, equipment, equipment rental, etc.) and all labor (i.e. manhours, overtime, etc.) which may be required for any proposed extra work. The Contractor shall not proceed until receiving a written order from the General Contractor establishing the agreed price and describing the work to be done.

3.17 DRAWINGS AND MEASUREMENTS

A. These specifications and accompanying drawings are intended to describe and provide for finished work. They are intended to be cooperative, and what is called for by either the drawings or specifications shall be as binding as if call for by both. The work herein described shall be complete in every detail.

B. The Drawings are not intended to be scaled for rough-in measurements, nor to serve as Shop Drawings. Field measurements necessary for ordering materials and fitting the installation to the building construction and arrangement shall be taken by the Contractor. The Contractor shall check latest architectural drawings to locate light switches, check latest structural drawings for interferences, etc.

END OF SECTION

SECTION 16060

GROUNDING AND BONDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding components.

B. Provide all components necessary to complete the grounding system(s) consisting of:
   1. Metal underground water pipe.
   2. Concrete-encased electrode.
   3. Rod electrodes.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

B. NFPA 99 - Standard for Health Care Facilities; National Fire Protection Association; 2005.

1.03 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 5 ohms.

1.04 SUBMITTALS

A. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

B. Project Record Documents: Record actual locations of components and grounding electrodes.

C. Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience with service facilities within 100 miles of Project.

C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

D. The Contractor shall be responsible for providing all grounding required in accordance with NEC and local code requirements. Grounding shown on the plans is minimum required.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cooper Power Systems: www.cooperpower.com.

B. Framatome Connectors International: www.fciconnect.com.

C. Lightning Master Corporation: www.lightningmaster.com.

D. American Electric.

E. Chance.

F. Burndy.

G. Cadweld.

2.02 GENERAL

A. The contractor shall install a grounding system in accordance with the drawings, specifications, and with the National Electrical Code, NEMA, USASI, and IEEE Standards, latest editions. The ground bar at the main service disconnect shall be bonded to the water mains, structural steel, and driven ground rods, by grounding electricode conductors. Maximum grounding resistance shall be achieved per NEC requirements.

2.03 ELECTRODES

A. Manufacturers:
   1. Cooper Power Systems: www.cooperpower.com.
   2. Framatome Connectors International: www.fciconnect.com.
   3. Lightning Master Corporation: www.lightningmaster.com.
   4. Chance.
   5. American Electric - Blackburn.

B. Rod Electrodes: Copper-clad steel.
   1. Diameter: 3/4 inch (19 mm).
   2. Length: 10 feet (3000 mm).

2.04 CONNECTORS AND ACCESSORIES

A. Mechanical Connectors: Bronze.
   1. Manufacturers: Chance, Burndy, American Electric - Blackburn.

B. Exothermic Connections:
   1. Product: Cadweld.

C. Wire: Stranded copper.

D. Foundation Electrodes: #3/0 AWG minimum.

E. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 INSTALLATION

A. Install ground electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

B. Provide grounding well pipe with cover at each rod location. Install well pipe top flush with finished grade.

C. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing. Bond steel together.

D. Provide bonding to meet requirements described in Quality Assurance.

E. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

F. Ground cables shall be protected by sleeves where the cables extend through a concrete surface. Ground inserts shall be used where ground cables extending through the surface would be exposed to damage during or after construction.

G. Where ground cables are installed in metallic conduit, the cables shall be bonded to the conduit at both ends of the run.

H. Welds on ground cables shall be cleaned and painted with an asphalt base paint where buried

underground or imbedded in concrete.

I. Install a minimum #12 AWG green grounding wire for each branch circuit. The grounding wire shall be connected to the grounding terminal bus bars in panelboards, and these bars shall be grounded to the building's grounding system.

J. Circuits run in PVC conduit shall have a separate ground wire.

END OF SECTION

SECTION 16070

HANGERS AND SUPPORTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MATERIALS

A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.

B. Supports: Fabricated of structural steel or formed steel members; galvanized. All structural supports and channels shall be manufactured from a minimum of #16 gauge ASTM A570 grade 33 steel.

C. Anchors and Fasteners:
   1. Do not use spring clips.
   2. Obtain permission from ENGINEER before using powder-actuated anchors.
   3. Concrete Structural Elements: Use precast inserts, expansion anchors, or preset inserts.
   4. Steel Structural Elements: Use beam clamps or welded fasteners.
   5. Concrete Surfaces: Use expansion anchors.
   6. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use hollow wall fasteners.
   7. Solid Masonry Walls: Use expansion anchors or preset inserts.
   8. Sheet Metal: Use sheet metal screws.
   9. Wood Elements: Use wood screws.

D. Formed Steel Channel:
   1. Product: B-Line Strut.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.
   1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
   2. Obtain permission from Structural Engineer before drilling or cutting structural members.

B. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

C. Install surface-mounted cabinets and panelboards with minimum of four anchors.

D. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch (25 mm) off wall.

E. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

SECTION 16075

ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

C. Underground warning tape.

D. Panel schedules.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Buried Electrical Lines: Underground warning tapes.

B. Electrical Distribution and Control Equipment Enclosures: Nameplates.

C. Junction Box Load Connections: Wire markers.

D. Outlet Box Load Connections: Wire markers.

E. Panel Gutter Load Connections: Wire markers.

2.02 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Seton Identification Products: www.seton.com/aec.

C. Thomas & Betts.

D. Panduit.

2.03 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.

B. Locations:
   1. Each electrical distribution and control equipment enclosure (including starters, disconnects, panelboards, breakers at distribution panels, etc.).
   2. Communication cabinets.

C. Letter Size:
   1. Use 1/2 inch (____ mm) letters for identifying equipment and loads. Identification shall indicate where the load is fed from.

2.04 WIRE MARKERS

A. Description: Vinyl cloth type self-adhesive wire markers.

B. Description: tape or split sleeve type wire markers.

C. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, and junction boxes each load connection.

D. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
   2. Control Circuits: Control wire number indicated on shop drawings.

2.05 UNDERGROUND WARNING TAPE

A. Description: 4 inch (100 mm) wide plastic tape, detectable type colored red with suitable warning legend describing buried electrical lines.

2.06 PANEL SCHEDULES

A. Each panel shall have a typewritten panel schedule indicating loads. A clear plastic cover over the schedule shall be provided to protect it.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.02 INSTALLATION

A. Install nameplates and labels parallel to equipment lines.

B. Secure nameplates to equipment front using screws or rivets.

C. Secure nameplates to inside surface of door on panelboard that is recessed in finished locations.

D. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches (75 mm) below finished grade.

END OF SECTION

SECTION 16123

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wire and cable for 600 volts and less.

B. Wiring connectors and connections.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SUBMITTALS

A. Project Record Documents: Record actual locations of components and circuits.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 PROJECT CONDITIONS

A. Verify that field measurements are as shown on the Drawings.

B. Conductor sizes are based upon copper unless indicated as aluminum "AL" on the Drawings.

C. Wire and cable routing shown on the Drawings are approximate unless dimensioned. Route wire and cable as required to meet project conditions.

D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

PART 2 PRODUCTS

2.01 WIRING REQUIREMENTS

A. Concealed Dry Interior Locations: Use only building wire in raceway or metal clad cable.

B. Exposed Dry Interior Locations: Use only building wire in raceway or building wire with Type THHN,THWN,XHHW insulation in raceway.

C. Above Accessible Ceilings: Use only building wire in raceway or metal clad cable.

D. Wet or Damp Interior Locations: Use only building wire with Type THWN, XHHW insulation in raceway.

E. Exterior Locations: Use only building wire with Type THWN or XHHW insulation in raceway.

F. Underground Installations: Use only building wire with Type THWN or XHHW insulation in raceway.

G. Use stranded conductors for control circuits.

H. Use conductor not smaller than 10 AWG for power and lighting circuits.

I. Use conductor not smaller than 14 AWG for control circuits.

J. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet (25 m).

K. Use 8 AWG conductors for 30 ampere, 120 volt branch circuits longer than 75 feet.

L. All feeders shall be sized for a maximum of 2% voltage drop. All branch circuits shall be sized for a maximum of 3% voltage drop.

2.02 WIRE MANUFACTURERS

A. Cerro Wire Inc.: www.cerrowire.com.

B. Industrial Wire & Cable, Inc.: www.iewc.com.

C. Southwire Company: www.southwire.com.

D. Royal.

E. Rome.

F. General Cable.

G. Triangle.

2.03 BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor: Copper. Class B strand per ICEA S-61-402.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: NFPA 70.
   1. For Feeders and Branch Circuits Equal to and Smaller Than 4/0 AWG (Dry and Damp locations): Type THHN rated 90 degrees C.
   2. For Feeders and Branch Circuits Equal to and Smaller Than 4/0 AWG (Wet locations): Type THWN rated 90 degrees C.
   3. For Feeders and Branch Circuits Larger Than 4/0 AWG (Dry and Damp locations): Type XHHW rated 90 degrees C.

2.04 METAL CLAD CABLE (TYPE MC CABLE)

A. Description: NFPA 70, Type MC.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation Temperature Rating: 75 degrees C.

E. Insulation Material: Thermoplastic.

F. Armor Material: Steel.

G. Armor Design: Interlocked metal tape.

H. Fittings: Shall be specifically designed for use with type MC cable.

2.05 WIRING CONNECTORS

A. Split Bolt Connectors:
   1. Manufacturers:
      a. Black Burn.
      b. T & B.
      c. Burndy.

B. Solderless Pressure Connectors:
   1. Manufacturers:

a. AMP.
b. T & B.
c. 3 M.

C. Spring Wire Connectors:
1. Manufacturers:
a. Buchanah Model B-Cap.
b. 3 M Model Scotchlok or Hyflex.
c. Panduit Model P-Conn.

D. Compression Connectors:
1. Manufacturers:
a. Neer.
b. T & B.
c. Appleton.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

C. Verify that raceway installation is complete and supported.

D. Verify that field measurements are as indicated.

3.02 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.03 INSTALLATION

A. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Route wire and cable as required to meet project conditions.
1. Wire and cable routing indicated is approximate unless dimensioned.
2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

C. Use wiring methods indicated.

D. All wiring shall be installed in conduit or approved raceway. All raceways shall be provided with a ground conductor unless noted otherwise.

E. Use stranded conductors for control circuits.

F. Pull all conductors into raceway at same time.

G. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

H. Protect exposed cable from damage.

I. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure. Do not rest cable on ceiling panels.

J. Use suitable cable fittings and connectors.

K. Neatly train and lace wiring inside boxes, equipment, and panelboards.

L. Clean conductor surfaces before installing lugs and connectors.

M. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

N. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

O. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

P. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

Q. Identify and color code wire and cable under provisions of Section 16075. Identify each conductor with its circuit number or other designation indicated.

R. Branch circuits may be combined up to 8 conductors (A-phase, B-phase, C-phase, neutral and A-phase, B-phase, C-phase, neutral) and 2 ground conductors in conduit. Contractor shall be responsible for derating conductors as required by N.E.C Article 310, Note 8.

S. Do not share neutral conductor on load side of dimmers.

T. Branch circuit neutral conductors: The use of multi-wire branch circuits with a common neutral is not permitted. Each branch circuit shall be furnished and installed with an accompanying neutral conductor sized the same as the phase conductor.

END OF SECTION

SECTION 16131

CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit, fittings and conduit bodies.

1.02 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.

B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.

C. ANSI C80.5 - American National Standard for Electrical Rigid Aluminum Conduit (ERAC); 2005.

D. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

E. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT); National Electrical Contractors Association; 2006.

F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.

G. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit; National Electrical Manufacturers Association; 2003.

H. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association; 2004.

I. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SUBMITTALS

A. Project Record Documents: Accurately record actual routing of conduits larger than 2 inches (51 mm).

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept conduit on site. Inspect for damage.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Protect PVC conduit from sunlight.

1.06 PROJECT CONDITIONS

A. Verify that field measurements are as shown on the drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

D. Coordinate painting requirements of exposed conduit in finished areas with specification section

09900 and color with Architect.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

A. Conduit Size: Comply with NFPA 70.
   1. Minimum Size: 3/4 inch (19 mm) where concealed within inaccessible construction (i.e. within walls, above drywall ceilings, etc.), 1/2" minimum elsewhere.

B. Underground Installations:
   1. More than 5 Feet (1.5 Meters) from Foundation Wall: Use galvanized rigid steel conduit, thickwall non-metallic conduit, or thinwall nonmetallic conduit.
   2. Within 5 Feet (1.5 Meters) from Foundation Wall: Use galvanized rigid steel conduit or thickwall nonmetallic conduit.
   3. In or Under Slab on Grade: Use galvanized rigid steel conduit or thickwall nonmetallic conduit.
   4. Minimum Size: 1 inch (25 mm).

C. Outdoor Locations Above Grade: Use galvanized rigid steel conduit.

D. In Slab Above Grade:
   1. Use galvanized rigid steel conduit.
   2. Maximum Size Conduit in Slab: 3/4 inch (19 mm); 1/2 inch (13 mm) for conduits crossing each other.

E. Wet and Damp Locations: Use galvanized rigid steel conduit or rigid aluminum conduit.

F. Dry Locations:
   1. Concealed: Use rigid steel conduit or electrical metallic tubing.
   2. Exposed: Use galvanized rigid steel conduit or electrical metallic tubing. Note: use Galvanized Rigid Steel (GRS) conduit where exposed/subject to damage (i.e. Mechanical Rooms, etc.) up to 10 feet above finished floor. Use electrical metallic tubing above 10 feet above finished floor.

G. Transformer and Motor Connections:
   1. Liquidtight flexible metal conduit (maximum length shall be 3'-0").

H. Lighting fixtures:
   1. From junction box to lighting fixture shall be flexible metal conduit (maximum length shall be 6'-0").

I. AC/MC Cable:
   1. Use for concealed branch circuit drops to devices or light fixtures. Do not use AC/MC cable for homeruns to panelboards.

J. Control Wiring (sound systems, security systems, temperature controls systems):
   1. Use electrical metallic tubing, except when making final connection to moving equipment where flexible conduit or sealtite should be used.

2.02 METAL CONDUIT

A. Manufacturers:
   1. Allied Tube & Conduit: www.alliedtube.com.
   2. Beck Manufacturing, Inc.: www.beckmfg.com.
   3. Wheatland Tube Company: www.wheatland.com.
   4. Century.

B. Rigid Steel Conduit: ANSI C80.1. Galvanized Rigid Steel (GRS).

C. Rigid Aluminum Conduit: ANSI C80.5.

D. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

1. Connectors and couplings shall be threaded, set-screw, or compression type, and concrete tight and/or rain tight where required.
2. Locknuts shall be malleable iron or steel. Bushings shall be malleable iron, steel, or plastic. Malleable iron or steel bushings shall be zinc or cadmium plated and shall have insulating insert of thermostatic plastic molded and locked into bushing ring. Plastic bushings shall be thermostatic phenolic insulating type. Use of non-rigid plastic bushings is prohibited.

2.03 FLEXIBLE METAL CONDUIT

A. Manufacturers:
   1. AFC Cable Systems, Inc.: www.afcweb.com.
   2. Electri-Flex Company: www.electriflex.com.
   3. International Metal Hose: www.metalhose.com.

B. Description: Interlocked steel construction.

C. Fittings: NEMA FB 1. cast fittings.

D. Flexible metal conduit shall have a separate grounding conductor.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:
   1. AFC Cable Systems, Inc.: www.afcweb.com.
   2. Electri-Flex Company: www.electriflex.com.
   3. International Metal Hose: www.metalhose.com.
   4. Anaconda Type "UA" for less than 1-1/4" and Type "EF" for larger than 1-1/2".

B. Description: Interlocked steel construction with PVC jacket.

C. Fittings: NEMA FB 1. cast fittings.

D. Flexible metal conduit shall have a separate grounding conductor.

2.05 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
   1. Allied Tube & Conduit: www.alliedtube.com.
   2. Beck Manufacturing, Inc.: www.beckmfg.com.
   3. Wheatland Tube Company: www.wheatland.com.

B. Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron set screw type.
   1. Connectors and couplings shall be threaded, set-screw, or compression type, and concrete tight and/or rain tight where required.
   2. Locknuts shall be malleable iron or steel. Bushings shall be malleable iron, steel, or plastic. Malleable iron or steel bushings shall be zinc or cadmium plated and shall have insulating insert of thermostatic plastic molded and locked into bushing ring. Plastic bushings shall be thermostatic phenolic insulating type. Use of non-rigid plastic bushings is prohibited.

2.06 NONMETALLIC CONDUIT

A. Manufacturers:
   1. AFC Cable Systems, Inc.: www.afcweb.com.
   2. Electri-Flex Company: www.electriflex.com.
   3. Carlon.

B. Description: NEMA TC 2; Schedule 40 = thinwall; 80 = thickwall PVC.

C. Fittings and Conduit Bodies: NEMA TC 3.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify routing and termination locations of conduit prior to rough-in.

B. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.02 INSTALLATION

A. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Install steel conduit as specified in NECA 101.

C. Install nonmetallic conduit in accordance with manufacturer's instructions.

D. Arrange supports to prevent misalignment during wiring installation.

E. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

F. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

G. Fasten conduit supports to building structure and surfaces under provisions of Section 16070.

H. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

I. Do not attach conduit to ceiling support wires.

J. Arrange conduit to maintain headroom and present neat appearance.

K. Route exposed conduit parallel and perpendicular to walls.

L. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

M. Route conduit in and under slab from point-to-point.

N. Do not cross conduits in slab.

O. Maintain adequate clearance between conduit and piping.

P. Maintain 12 inch (300 mm) clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).

Q. Cut conduit square using saw or pipecutter; de-burr cut ends.

R. Bring conduit to shoulder of fittings; fasten securely.

S. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

T. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations, and to cast boxes.

U. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2 inch (50 mm) size. Elbows larger than 3" dia. shall be long radius elbows.

V. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

W. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control, and expansion joints.

X. Provide suitable pull string in each empty conduit except sleeves and nipples.

Y. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

Z. Ground and bond conduit under provisions of Section 16060.

AA. Identify conduit under provisions of Section 16075.

AB. Underground exterior conduits shall be sloped away from the building at a minimum of 4" per 100' or 0.33%.

AC. Install insulating bushings at open ends of telephone, data, video, security, etc. conduits.

AD. Drawstrings shall be provided for all new empty conduits. Drawstring shall be wax impregnated, nylon, or other synthetic material resistant to moisture and mildew to prevent deterioration.

AE. All underground conduits and/or duct banks shall be installed 24" minimum below grade (unless noted otherwise) and shall slope minimum of 0.33% to manholes, handholes, cable vaults, or other structures.

3.03 FIRESTOPPING

A. Use only firestop products that have been tested according to ASTM E-814 and UL 1479 for the conditions set forth regarding construction assembly type, penetrating item type, annular space requirements and fire rating.

B. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07840.
   1. For non-combustible penetrations including conduit not passing through a sleeve, the following materials are acceptable:
      a. Hilti FS 601 Elastmeric Firestop Sealant.
      b. 3 M.
      c. CSD Sealing Systems.
      d. Firestop Systems.
   2. For non-combustible penetrations including sleeved conduits, the following materials are acceptable:
      a. Hilti FS 601 Elastmeric Firestop Sealant.
      b. 3 M.
      c. CSD Sealing Systems.
      d. Firestop Systems.
   3. For combustible penetrations including cables and cable bundles, the following materials are acceptable:
      a. Hilti FS 611A Intumescent Firestop Sealant.
      b. 3 M.
      c. CSD Sealing Systems.
      d. Firestop Systems.
   4. For large or complex penetrations involving multiple conduits, cable trays, electrical bussway, etc. the following materials are acceptable:
      a. Hilti FS 635 Firestop Compound.
      b. 3 M.
      c. CSD Sealing Systems.
      d. International Protective Coatings - KBS Sealbags.

3.04 PAINTING

A. All conduit exposed in finished areas shall be painted to match the surrounding finishes. Refer to specification section 09900 - Coordinate color with Architect.

END OF SECTION

SECTION 16138

BOXES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall and ceiling outlet boxes.

B. Pull and junction boxes.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.

C. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2008.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.

E. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SUBMITTALS

A. Project Record Documents: Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Provide products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

C. Pull boxes, junction boxes, and cable support boxes of proper size and design shall be provided in accordance with the N.E.C. and as required to facilitate installation of wires. All boxes shall be sized in accordance with the N.E.C. Covers shall be gasketed and held in place with corrosion resistant machine screws. Cable supports for vertical runs shall be provided at code required locations, within pull or junction boxes. Boxes shall be NEMA 12 for inside and NEMA 4 for outside use where exposed to the weather or where otherwise called for on the drawings.

PART 2 PRODUCTS

2.01 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
   1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch (13 mm) male fixture studs where required.
   2. Concrete Ceiling Boxes: Concrete type.

B. Cast Boxes: NEMA FB 1, Type FD, cast feralloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.

C. Wall Plates for Finished Areas: As specified in Section 16140.

D. Outlet and switch boxes shall be minimum of 2-1/8" deep. When installed in a poured wall a 2-1/2" minimum deep box shall be used. When installed in masonry a 3-1/2" minimum deep box

shall be used.

E. Use 2-gang 4" square boxes with single plaster rings for single device outlets.

F. Outlet boxes installed in hazardous areas shall be approved for the Hazardous Class, Division and Group as required by N.E.C. and/or identified on the drawings.

2.02 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
   1. Material: Galvanized cast iron.
   2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

C. In-Ground Cast Metal Box: NEMA 250, Type 6, inside flanged, recessed cover box for flush mounting:
   1. Material: Galvanized cast iron.
   2. Cover: Smooth cover with neoprene gasket and stainless steel cover screws.
   3. Cover Legend: "ELECTRIC".

D. Fiberglass Handholes: Die molded glass fiber hand holes:
   1. Composite handholds shall be constructed of polymer concrete and reinforced by a heavy weave fiberglass. The handholes shall have internal dimensions not less than that indicated. The material shall have the following properties:
      a. Compressive strength: 11,000 PSI; Tensile strength: 1,700 PSI; Flexural strength: 7,500 PSI.
   2. Cable Entrance: Pre-cut 6 x 6 inch (150 x 150 mm) cable entrance at center bottom of each side.
   3. Cover: Glass fiber weatherproof cover with nonskid finish.
   4. Manufacturer:
      a. Quazite.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify locations of floor boxes and outlets in offices and work areas prior to rough-in.

B. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose.

3.02 INSTALLATION

A. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.

C. Coordinate installation of outlet boxes for equipment connected under Section 16155.

D. Set wall mounted boxes at elevations to accommodate mounting heights indicated.

E. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.

F. Orient boxes to accommodate wiring devices oriented as specified in Section 16140.

G. Maintain headroom and present neat mechanical appearance.

H. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

I. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches (150 mm) from ceiling access panel or from removable recessed luminaire.

J. Provide identification labels on all junction boxes indicating what systems/equipment circuits are feeding (i.e. Lights in Room #102) and where they are being fed from (ie. Panel LP-1)

K. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07840.

L. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

M. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.

N. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

O. Use flush mounting outlet box in finished areas.

P. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

Q. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches (150 mm) separation. Provide minimum 24 inches (600 mm) separation in acoustic rated walls.

R. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

S. Use stamped steel bridges to fasten flush mounting outlet box between studs.

T. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

U. Use adjustable steel channel fasteners for hung ceiling outlet box.

V. Do not fasten boxes to ceiling support wires.

W. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches (305 mm) of box.

X. Use gang box where more than one device is mounted together. Do not use sectional box. Telephone/Data gang boxes shall be separate from power device gang boxes.

Y. Use 2-gang 4" square boxes with single plaster rings for single device outlets.

Z. Use cast outlet box in exterior locations and wet locations.

3.03 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused box openings.

3.04 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 16140

WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Wall plates.

1.02 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G, 2001.

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.

C. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

D. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).

E. NEMA WD 6 - Wiring Device -- Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).

F. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

G. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

H. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

I. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

J. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

K. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
   3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
   4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
   5. Notify ENGINEER of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:
   1. Do not install wiring devices until final surface finishes and painting are complete.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
   1. Wall Dimmers: Include derating information for ganged multiple devices.

B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Operation and Maintenance Data:
   1. Wall Dimmers: Include information on operation and setting of presets.
   2. GFI Receptacles: Include information on status indicators and testing procedures and intervals.

D. Project Record Documents: Record actual installed locations of wiring devices.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cooper Wiring Devices: www.cooperwiringdevices.com.

B. Leviton Manufacturing, Inc.: www.leviton.com.

C. Hubbell.

D. Bryant.

2.02 APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. Provide weather resistant GFI receptacles with specified weatherproof covers for all receptacles installed outdoors or in damp or wet locations.

C. Provide GFI receptacles for all receptacles installed within 6 feet (1.8 m) of sinks.

D. Provide GFI receptacles for all receptacles installed in kitchens.

E. Provide GFI receptacles for all receptacles serving electric drinking fountains.

F. Unless noted otherwise, do not use combination switch/receptacle devices.

2.03 ALL WIRING DEVICES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

B. Finishes:
   1. All Wiring Devices: Ivory with stainless steel wall plate unless otherwise indicated.
   2. Coordinate all device and cover plate colors/finishes with ARCHITECT prior to ordering.

2.04 WALL SWITCHES

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell-wiring.com.
   2. Leviton Manufacturing Company, Inc.: www.leviton.com.
   3. Pass & Seymour, a brand of Legrand North America, Inc.: www.legrand.us

B. All Wall Switches: AC only, quiet operating, general-use snap switches with silver alloy contacts,

complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Commercial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.05 WALL DIMMERS

A. All Wall Dimmers: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

B. Wall Dimmers: Semiconductor dimmer for incandescent lamps, Type I, complying with NEMA WD 6 and WD 1. Preset slide controls - Single pole and 3-way with LED locator.
1. Manufacturers:
   a. Hubbell.
   b. Lutron.
   c. Leviton "IllumaTech Series".
2. Body and Handle: Ivory plastic with preset linear slide. Coordinate color selection with Architect prior to ordering.
3. Voltage: Match lighting circuit voltage volts.
4. Power Rating: Match load shown on drawings; 600 watts minimum.
5. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

2.06 RECEPTACLES

A. All Receptacles: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
2. NEMA configurations specified are according to NEMA WD 6.

B. Convenience Receptacles:
1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
2. Tamper Resistant and Weather Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R,, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

C. GFI Receptacles:
1. All GFI Receptacles: Provide with feed-through protection, light to indicate ground fault tripped condition and loss of protection, and list as complying with UL 943, class A.
   a. Provide test and reset buttons of same color as device.
2. Standard GFI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
3. Tamper Resistant and Weather Resistant GFI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

2.07 WALL PLATES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell-wiring.com.
2. Leviton Manufacturing Company, Inc.: www.leviton.com.
3. Pass & Seymour, a brand of Legrand North America, Inc.: www.legrand.us

B. All Wall Plates: Comply with UL 514D.
1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
2. Size: Oversized.
3. Screws: Metal with slotted heads finished to match wall plate finish.

C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

D. Weatherproof Covers for Damp Locations: Gasketed, thermoplastic, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

E. Weatherproof Covers for Wet Locations: Gasketed, thermoplastic, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

B. Verify that wall openings are neatly cut and will be completely covered by wall plates.

C. Verify that final surface finishes are complete, including painting.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

E. Verify that openings in access floor are in proper locations.

F. Verify that conditions are satisfactory for installation prior to starting work.

G. Verify door openings/swings with Architectural trades prior to installation.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 16138 as required for installation of wiring devices provided under this section.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Unless otherwise indicated, GFI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFI protection.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

J. Install wall switches with OFF position down.

K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

L. Do not share neutral conductor on branch circuits utilizing wall dimmers.

M. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

P. Install identification label for wall switches and wall dimmers in accordance with Section 16075 indicating load served when controlling loads that are not visible from the control location or multiple wall switches or wall dimmers are installed at one location.

Q. Install identification label for all receptacles in accordance with Section 16075 indicating serving branch circuit.

R. Use jumbo size plates for outlets installed in masonry walls.

S. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

T. Install protective rings on active flush cover service fittings.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 16138 to obtain mounting heights indicated on drawings.

B. Install convenience receptacles 18 inches (450 mm) above finished floor to center of box (not otherwise specified).

C. Install convenience and special purpose receptacle outlets in CLASS 1 locations at 24" above the floor to bottom of box.

D. Install convenience receptacles in CMU walls at 16 inches above floor to bottom of box.

E. Unless noted otherwise, install GFI receptacles in toilet/bath rooms, janitor closets, mechanical, and storage rooms 48 inches to top of the box above floor.

F. Install convenience receptacles 6 inches (150 mm) above counter. Or as required to accommodate the counter construction - refer to Architectural elevations.

G. Install telephone jacks, data outlets, communication outlets, etc. 18 inches (450 mm) to center of box above finished floor. For CMU walls - 16" to bottom of box above finished floor.

H. Coordinate all finishes and colors of wiring devices with Architect prior to ordering.

I. Coordinate mounting height/locations with Architectural Elevations prior to rough-in.

3.05 FIELD QUALITY CONTROL

A. Inspect each wiring device for damage and defects.

B. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

C. Operate each wall switch with circuit energized and verify proper operation.

D. Verify that each receptacle device is energized.

E. Test each receptacle to verify operation and proper polarity.

F. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

G. Correct wiring deficiencies and replace damaged or defective wiring devices.

H. NOTE: All receptacles in residential uses (i.e. apartments, housing, hotels, etc.) shall be "Tamper Resistant" (TR) rated, residential grade. Receptacles within other commercial buildings/areas with children use (i.e. schools, daycare facilities, classrooms, libraries, etc.) shall be "Tamper Resistant" (TR) rated, commercial grade.

3.06 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.07 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 16145

LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.

B. Time switches.

C. Outdoor photo controls.

1.02 REFERENCE STANDARDS

A. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2006.

B. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment - Nonlocking (Button) Type Photocontrols; 2004 (R2010).

C. NECA 1 - Standard for Good Workmanship in Electrical Contracting; 2006.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.

E. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

F. UL 773 - Plug-in Locking Type Photocontrols for Use with Area Lighting; Current Edition, Including All Revisions.

G. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.

H. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.

I. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
   3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
   4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
   5. Notify ENGINEER of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:
   1. Do not install lighting control devices until final surface finishes and painting are complete.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
   1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C. Shop Drawings:
   1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

D. Field Quality Control Reports.

E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data: Include detailed information on device programming and setup.

G. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.07 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.08 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all occupancy sensors.

PART 2 PRODUCTS

2.01 ALL LIGHTING CONTROL DEVICES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

A. Manufacturers:
   1. Hubbell Building Automation, Inc.: www.hubbellautomation.com
   2. Sensor Switch Inc.: www.sensorswitch.com.
   3. WattStopper: www.wattstopper.com.
   4. Leviton.
   5. Cooper.
   6. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. All Occupancy Sensors:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
   a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
   b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
   c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
   d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
7. Turn-Off Delay: Field adjustable, up to a maximum time delay setting of not less than 15 minutes and not more than 30 minutes.
8. Sensitivity: Field adjustable.
9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
10. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.
11. Compatibility: Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
12. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on the drawings.
13. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.

C. Wall Switch Occupancy Sensors:
1. All Wall Switch Occupancy Sensors:
   a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
   b. Unless otherwise indicated or required to control the load indicated on the drawings, provide line voltage units with self-contained relay.
   c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.
   d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
   e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
   f. Finish: Match finishes specified for wiring devices in Section 16140, unless otherwise indicated.
2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion

within an area of 900 square feet (83.6 sq. m).

3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 400 square feet (37.2 sq. m).
4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq. m).

D. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
   a. Description: Low profile occupancy sensors designed for ceiling installation.
   b. Unless otherwise indicated or required to control the load indicated on the drawings, provide low voltage units, for use with separate compatible accessory power packs.
   c. Provide field selectable setting for disabling LED motion detector visual indicator.
   d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
   e. Finish: White unless otherwise indicated.
2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 square meters) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
   b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet (111.5 sq. m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
3. Ultrasonic Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 500 square feet (46.5 sq. m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
   b. Medium Range Sensors: Capable of detecting motion within an area of 1,000 square feet (92.9 sq. m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
   c. Extended Range Sensors: Capable of detecting motion within an area of 2,000 square feet (185.8 sq. m) at a mounting height of 9 feet (2.7 m).
4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq. m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
   b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet (111.5 sq. m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq. m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
   b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet (111.5 sq. m) at a mounting height of 9 feet (2.7 m).

E. Directional Occupancy Sensors:
1. All Directional Occupancy Sensors: Designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
   a. Unless otherwise indicated or required to control the load indicated on the drawings, provide low voltage units, for use with separate compatible accessory power packs.
   b. Provide field selectable setting for disabling LED motion detector visual indicator.
   c. Finish: White unless otherwise indicated.
2. Passive Infrared (PIR) Directional Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within a distance of 40 feet (12 m) at a mounting height of 10 feet (3.1 m).
   b. Long Range Sensors: Capable of detecting motion within a distance of 80 feet (24 m) at a mounting height of 10 feet (3.1 m).

c. High Bay Sensors: Capable of detecting motion within a distance of 50 feet (15 m) at a mounting height of 30 feet (9.1 m).

3. Passive Infrared/Ultrasonic Dual Technology Directional Occupancy Sensors: Capable of detecting motion within a distance of 40 feet (12 m) at a mounting height of 10 feet (3.1 m).

F. Power Packs for Low Voltage Occupancy Sensors:
1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on the drawings.
3. Input Supply Voltage: Dual rated for 120/277 V ac.
4. Load Rating: As required to control the load indicated on the drawings.
5. All power packs shall have auxiliary HVAC relay.

G. Accessories:
1. Provide heavy duty coated steel wire protective guards compatible with specified occupancy sensors where indicated.

2.03 TIME SWITCHES

A. Manufacturers:
1. Intermatic, Inc.: www.intermatic.com.
2. Paragon, a brand of Invensys Controls: www.invensyscontrols.com.
3. Tork, a division of NSI Industries LLC: www.tork.com.
4. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. Digital Electronic Time Switches:
1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
2. Program Capability:
a. 24-Hour Time Switches: Single channel, with same schedule for each day of the week and skip-a-day feature to omit selected days.
b. 7-Day Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days.
c. Astronomic Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
3. Schedule Capacity: Not less than 16 programmable on/off operations.
4. Provide automatic daylight savings time and leap year compensation.
5. Provide power outage backup to retain programming and maintain clock.
6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
7. Provide remote photocell input with light level adjustment.
8. Input Supply Voltage: As indicated on the drawings.
9. Output Switch Configuration: As required to control the load indicated on the drawings.
10. Output Switch Contact Ratings: As required to control the load indicated on the drawings.
11. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:
a. Indoor clean, dry locations: Type 1.
b. Outdoor locations: Type 3R.
12. Provide flush-mounted unit where indicated, where mounted in public areas, or where mounted adjacent to flush-mounted equipment.

2.04 OUTDOOR PHOTO CONTROLS

A. Manufacturers:

1. Intermatic, Inc.: www.intermatic.com.
2. Paragon, a brand of Invensys Controls: www.invensyscontrols.com.
3. Tork, a division of NSI Industries LLC: www.tork.com.
4. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. Stem-Mounted Outdoor Photo Controls:
1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
2. Housing: Weatherproof, impact resistant polycarbonate.
3. Photo Sensor: Cadmium sulfide.
4. Provide external sliding shield for field adjustment of light level activation.
5. Light Level Activation: 1 to 5 footcandles (10.8 to 53.8 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
6. Voltage: As required to control the load indicated on the drawings.
7. Failure Mode: Fails to the on position.
8. Load Rating: As required to control the load indicated on the drawings.
9. Provide accessory wall-mounting bracket where indicated or as required to complete installation.

C. Locking Receptacle-Mounted Outdoor Photo Controls
1. Description: Plug-in locking type photo control unit complying with ANSI C136.10 for mounting on a compatible receptacle, listed and labeled as complying with UL 773.
2. Housing: Weatherproof, impact resistant UV stabilized polypropylene, color to be selected.
3. Photo Sensor: Cadmium sulfide.
4. Light Level Activation: 1 to 3 footcandles (10.8 to 32.3 lux) turn-on and 1.5 to 1 turn-off to turn-on ratio with instant turn-on and delayed turn-off.
5. Voltage: As required to control the load indicated on the drawings.
6. Failure Mode: Fails to the on position.
7. Load Rating: As required to control the load indicated on the drawings.
8. Surge Protection: 160 joule metal oxide varistor.
9. Provide the following accessories where indicated or as required to complete installation:
   a. Receptacle: Complying with ANSI C136.10.
   b. Mounting Bracket.
   c. Shorting Cap: Suitable for replacing locking photo control to complete circuit.

D. Button Type Outdoor Photo Controls
1. Description: Direct-wired photo control unit complying with ANSI C136.24 with weatherproof gasketed wall plate where required or indicated, listed and labeled as complying with UL 773A.
2. Housing: Weather resistant polycarbonate.
3. Photo Sensor: Cadmium sulfide.
4. Light Level Activation: 1 to 3 footcandles (10.8 to 32.3 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
5. Voltage: As required to control the load indicated on the drawings.
6. Failure Mode: Fails to the on position.
7. Load Rating: As required to control the load indicated on the drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated

B. Coordinate locations of outlet boxes provided under Section 16138 as required for installation of lighting control devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switch Occupancy Sensors: 48 inches (1.2 m) above finished floor.
   2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
   3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify ENGINEER to obtain direction prior to proceeding with work.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 16140.

G. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

H. Install identification label for wall switch occupancy sensors, in-wall time switches, in-wall interval timers, and accessory manual wall switches in accordance with Section 16075 indicating load served where indicated, when controlling loads that are not visible from the control location, or when multiple control devices are installed at one location.

I. Occupancy Sensor Locations:
   1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
   2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

J. Outdoor Photo Control Locations:
   1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing

photo sensor is not possible, install with photo sensor facing east, west, or down.

2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

K. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

L. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

M. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

N. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

O. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

P. Where indicated or required, provide cabinet or enclosure in accordance with Section 16139 for mounting of lighting control device system components.

3.04 FIELD QUALITY CONTROL

A. See Section 01400 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Test time switches to verify proper operation.

E. Test outdoor photo controls to verify proper operation, including time delays where applicable.

F. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.

G. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by ENGINEER.

C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.

D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by ENGINEER. Record settings in written report to be included with submittals.

F. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by ENGINEER.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match

original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of lighting control devices to ENGINEER, and correct deficiencies or make adjustments as directed.

B. Training: Train OWNER's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
   3. Location: At project site.

END OF SECTION

SECTION 16155

EQUIPMENT WIRING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).

B. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).

C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.04 COORDINATION

A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

B. Determine connection locations and requirements.

C. Sequence rough-in of electrical connections to coordinate with installation of equipment.

D. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Conform to NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 16423, 16426 and in individual equipment sections.

C. Wiring Devices: As specified in Section 16140.

D. Flexible Conduit: As specified in Section 16131.

E. Wire and Cable: As specified in Section 16123.

F. Boxes: As specified in Section 16138.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations. Maximum length shall be 6 feet. Minimum size shall be 3/4" diameter.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 16210

ELECTRICAL UTILITY SERVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metering transformer cabinets.

B. Meter bases.

C. Arrangement with Utility Company for permanent electrical service, including payment of Utility Company charges for service. The Contractor shall be responsible for providing drawings to the Utility Company for Coordination of services and charges.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SYSTEM DESCRIPTION

A. System Characteristics: 120/240 volts, single phase, three-wire, 60 Hertz.

B. Service Entrance: Underground service entrance.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with utility company written requirements and NFPA 70.
   1. Maintain one copy of each document on site.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 PRE-INSTALLATION MEETING

A. Convene one week prior to commencing work of this section. Review service entrance requirements and details with Utility Company representative.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Metering Transformer Cabinets: Sheet metal cabinet with hinged door, conforming to utility company requirements, with provisions for locking and sealing.
   1. Size: As required by utility.

B. Meter Base: Furnished by utility company.

C. Utility Transformer Pad: Prefabricated precast concrete transformer pad with cable pit.

D. Other Components: As required by utility company.

PART 3 EXECUTION

3.01 PREPARATION

A. Arrange with utility company to obtain permanent electric service to the Project. The Contractor shall be responsible for providing drawings to the Utility Company for Coordination of services and charges.

B. Verify that field measurements are as indicated on utility company drawings.

C. Coordinate location of Utility Company's facilities to ensure proper access is available.

3.02 INSTALLATION

A. Install transformer pad, metering transformer cabinets, and meter base as required by utility company.

B. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

END OF SECTION

SECTION 16412

ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

B. Fusible switches.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.

C. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 2001 (R2006).

D. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

G. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

H. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Notify ENGINEER of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

B. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.
   2. Include wiring diagrams showing all factory and field connections.

C. Project Record Documents: Record actual locations of enclosed switches.

D. Maintenance Materials: Furnish the following for OWNER's use in maintenance of project.
   1. See Section 01600 - Product Requirements, for additional provisions.

2. See Section 16491 for requirements for spare fuses and spare fuse cabinets.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.07 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed switches.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. General Electric Company: www.geindustrial.com.

B. Schneider Electric; Square D Products: www.schneider-electric.us.

C. Siemens.

D. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break, enclosed safety switches complying with NEMA KS 1, GD (general duty), and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:
   1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
   2. Minimum Ratings:
      a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
      b. General Duty Single Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
      c. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T

Fuses: 200,000 rms symmetrical amperes.

d. Double Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.

G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

H. Provide with switch blade contact position that is visible when the cover is open.

I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
   1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

J. Conductor Terminations: Suitable for use with the conductors to be installed.

K. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

L. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

M. Enclosures: Comply with NEMA KS 1 and NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

N. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

O. General Duty Switches:
   1. Conductor Terminations:
      a. Provide mechanical lugs.
      b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Provide externally operable handle with means for locking in the OFF position, capable of accepting two padlocks.

P. Provide the following features and accessories where indicated or where required to complete installation:
   1. Hubs: As required for environment type; sized to accept conduits to be installed.
   2. Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install enclosed switches in accordance with manufacturer's instructions.

B. Install enclosed switches securely, in a neat and workmanlike manner in accordance with NECA

1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 16070.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 16060.

H. Provide fuses complying with Section 16491 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

J. Provide identification nameplate for each enclosed switch in accordance with Section 16075.

K. Provide identification label on inside door of each fused switch indicating NEMA fuse class and size installed in accordance with Section 16075.

L. Provide arc flash warning labels in accordance with NFPA 70.

M. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.03 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.04 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 16423

ENCLOSED MOTOR CONTROLLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manual motor controllers.

B. Magnetic motor controllers.

C. Combination magnetic motor controllers and disconnects.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC; National Electrical Manufacturers Association; 2000 (R2005).

C. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; National Electrical Manufacturers Association; 2000.

D. NEMA ICS 6 - Industrial Control and Systems: Enclosures; National Electrical Manufacturers Association; 1993 (R2006).

E. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 2001 (R2006).

F. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.03 SUBMITTALS

A. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Maintenance Data: Replacement parts list for controllers.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 SPARE PARTS

A. Keys: Furnish 2 of each for Owner's use.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. General Electric Company: www.geindustrial.com.

B. Square D: www.squared.com.

C. Allen Bradley.

D. Siemens.

2.02 MANUAL CONTROLLERS

A. Manual Motor Controllers: NEMA ICS 2, AC general-purpose, Class A, manually operated, full-voltage controller with overload element, red pilot light, NO auxiliary contact, and toggle operator with handle guard/lock off feature.

B. Fractional Horsepower Manual Controllers: NEMA ICS 2, AC general-purpose, Class A, manually operated, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light, and toggle operator with handle guard/lock off feature.

C. Enclosures: NEMA ICS 6, Type 1 for interior, dry locations; Type 4X for exterior and damp locations.

2.03 AUTOMATIC CONTROLLERS

A. Magnetic Motor Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower.

B. Coil Operating Voltage: 120 volts, 60 Hertz.

C. Overload Relays: NEMA ICS 2; bimetal.

D. Ground fault protection: Each starter shall be provided with ground fault protection system.

E. Enclosures: NEMA ICS 6, Type 1 for interior, dry locations; Type 4X for exterior and damp locations.

2.04 ACCESSORIES

A. Auxiliary Contacts: NEMA ICS 2, 2 field convertible contacts in addition to seal-in contact.

B. Cover Mounted Pilot Devices: NEMA ICS 5, heavy duty type.

C. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.

D. Pushbuttons: Lockable type.

E. Indicating Lights: NEMA ICS 2; RUN; Red in front cover; Transformer, LED type.

F. Selector Switches: NEMA ICS 2; HAND/OFF/AUTO, in front cover.

G. Relays: NEMA ICS 2,.

H. Control Power Transformers: 120 volt secondary, 100 VA minimum, in each motor starter. Provide fused primary, secondary, and bond unfused leg of secondary to enclosure.

I. Overload Relays: NEMA ICS 2; bimetal.

2.05 DISCONNECTS

A. Combination Controllers: Combine motor controllers with disconnects in common enclosure. Obtain IEC Class 2 coordinated component protection.

B. Nonfusible Switch Assemblies: NEMA KS 1, enclosed knife switch with externally operable handle.

C. Fusible Switch Assemblies: NEMA KS 1, enclosed knife switch with externally operable handle. Fuse clips: Designed to accommodate Class R fuses.

D. Provide handle guard/lock-off feature for all motor starter disconnects.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install enclosed controllers where indicated, in accordance with manufacturer's instructions.

B. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

C. Provide supports in accordance with Section 16070.

D. Height: 5 ft. (1500 mm) to operating handle.

E. Provide fuses for fusible switches; refer to Section 16491 for product requirements.

F. Select and install overload heater elements in motor controllers to match installed motor characteristics.

G. Provide engraved plastic nameplates; refer to Section 16075 for product requirements and location.

H. Neatly type label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating. Place label in clear plastic holder.

END OF SECTION

SECTION 16443

PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.02 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision D, 2006.

B. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; National Electrical Contractors Association; 2009.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.

E. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association; 2006.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association; 2007.

G. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.

H. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

O. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify ENGINEER of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS

A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

B. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

C. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.07 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
   1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

C. LOAD CENTERS ARE NOT ACCEPTABLE FOR USE AS LIGHTING AND APPLIANCE PANELBOARDS.

1.08 MAINTENANCE MATERIALS

A. Furnish two of each panelboard key.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. General Electric Company: www.geindustrial.com.

B. Schneider Electric; Square D Products: www.schneider-electric.us.

C. Siemens.

D. Note: Base Bid Square D. Other approved manufacturers may be bid as alternates.

2.02 ALL PANELBOARDS

A. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
   2. Label equipment utilizing series ratings as required by NFPA 70.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   2. Provide 200 percent rated neutral bus and lugs where indicated, where oversized neutral conductors are provided, or where panelboards are fed from K-rated transformers.
   3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
   4. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
      b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
      c. Provide removable end walls for NEMA Type 1 enclosures.
      d. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
      c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided, list and label panelboards as a complete assembly including surge protective device.

L. Load centers are not acceptable.

M. Provide the following features and accessories where indicated or where required to complete installation:
   1. Feed-through lugs.
   2. Sub-feed lugs.

2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Products:
   1. Square D I-Line.

C. Conductor Terminations:
   1. Main and Neutral Lug Material: Copper.
   2. Main and Neutral Lug Type: Mechanical.

D. Bussing:
   1. Phase and Neutral Bus Material: Copper.
   2. Ground Bus Material: Copper.

E. Circuit Breakers:
   1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
   2. Provide thermal magnetic circuit breakers unless otherwise indicated.
   3. Provide electronic trip circuit breakers where indicated.

F. Enclosures:
   1. Provide surface-mounted enclosures unless otherwise indicated.
   2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Products:
   1. Square D NQ.

C. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

D. Bussing:
   1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
   2. Phase and Neutral Bus Material: Aluminum or copper.
   3. Ground Bus Material: Aluminum or copper.

E. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

F. Enclosures:
   1. Provide surface-mounted or flush-mounted enclosures as indicated.
   2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent

protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

G. Provide column-width panelboards with accessory column-width cable trough and pullbox where indicated.

H. NOTE: All branch circuits feeding outlets installed in dwelling unit bedrooms shall be protected by an arc-fault circuit interuptor, either arc-fault rated outlet or breaker, in accordance with NEC 210.12.

I. Enclosure: NEMA PB 1, Type 1. (Type 3R for exterior locations).

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
   a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      2) 14,000 rms symmetrical amperes at 480 VAC.
   b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
3. Conductor Terminations:
   a. Provide mechanical lugs unless otherwise indicated.
   b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
   b. Provide interchangeable trip units where indicated.
5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
   a. Provide the following field-adjustable trip response settings:
      1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
   b. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control short time delay and ground fault delay functions for system coordination purposes.
   c. Provide communication capability where indicated: Compatible with system indicated.
6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
7. Provide the following circuit breaker types where indicated:
   a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
   b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
   c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
   d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
   e. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the

let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.

8. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
9. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.
10. Do not use tandem circuit breakers.
11. Do not use handle ties in lieu of multi-pole circuit breakers.
12. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
13. Provide the following features and accessories where indicated or where required to complete installation:
    a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
    b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.
    c. Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
    d. Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
    e. Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

2.06 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install panelboards securely, in a neat and workmanlike manner in accordance with NECA 1 (general workmanship), NECA 407 (panelboards), and NEMA PB 1.1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 16070.

E. Install panelboards plumb.

F. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.

H. Provide grounding and bonding in accordance with Section 16060.
    1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
    2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.

I. Install all field-installed branch devices, components, and accessories.

J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

K. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

L. Set field-adjustable circuit breaker tripping function settings as indicated.

M. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

N. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.

O. Install panelboards plumb. Install recessed panelboards flush with wall finishes.

P. Height: 6 feet (1800 mm) to top of panelboard; install panelboards taller than 6 feet (1800 mm) with bottom no more than 4 inches (100 mm) above floor.

Q. Provide filler plates to cover unused spaces in panelboards.

R. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
   1. Emergency and night lighting circuits.
   2. Fire detection and alarm circuits.
   3. Communications equipment circuits.
   4. Intrusion detection and access control system circuits.
   5. Video surveillance system circuits.

S. Provide computer-generated circuit directory for each lighting and appliance panelboard, and each power distribution panelboard provided with a door, clearly and specifically indicating the loads served. Identify spares and spaces. Revise directory to reflect circuiting changes required to balance phase loads.

T. Provide identification nameplate for each power distribution panelboard branch device in accordance with Section 16075, clearly and specifically indicating the loads served.

U. Provide identification nameplate for each panelboard in accordance with Section 16075.

V. Provide arc flash warning labels in accordance with NFPA 70.

W. Provide floor markings to clearly indicate required working clearances where indicated or where required by the authority having jurisdiction.

X. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.

Y. Minimum spare conduits: 5 empty 1 inch (DN27). Spare conduits shall be stubbed up into an accessible ceiling space.

Z. Ground and bond panelboard enclosure according to Section 16060 and current electrical codes.

3.03 FIELD QUALITY CONTROL

A. Correct deficiencies and replace damaged or defective panelboards or associated components.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 16491

FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fuses.

1.02 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; National Electrical Manufacturers Association; 2002 (R2007).

B. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

D. UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses; Current Edition, Including All Revisions.

E. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses; Current Edition, Including All Revisions.

F. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
   2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
   3. Notify ENGINEER of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 MAINTENANCE MATERIALS

A. Furnish three of each size and type fuse installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cooper Bussmann, Inc.: www.cooperbussmann.com.

B. GE Industrial: www.geindustrial.com.

C. Mersen (formerly Ferraz Shawmut): ferrazshawmut.mersen.com.

D. Littelfuse, Inc.: www.littelfuse.com.

2.02 APPLICATIONS

A. General Purpose Branch Circuits: Class RK1, time-delay.

B. Individual Motor Branch Circuits: Class RK1, time-delay.

C. In-Line Protection for Pole-Mounted Luminaires: Class CC, time-delay.

D. Primary Protection for Control Transformers: Class CC, time-delay.

2.03 FUSES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose indicated.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

H. Class L Fuses: Comply with UL 248-10.

I. Class CC Fuses: Comply with UL 248-4.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

SECTION 16510

INTERIOR LUMINAIRES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts.

E. Fluorescent dimming ballasts and controls.

F. Fluorescent emergency power supply units.

G. Lamps.

H. Luminaire accessories.

1.02 REFERENCE STANDARDS

A. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low Pressure Sodium Lamps (Multiple-Supply Type); 2002.

B. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; Consolidated-2002.

C. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (R2008).

D. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

E. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association; 2006.

F. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; National Electrical Contractors Association; 2006.

G. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Fluorescent Ballasts; National Electrical Manufacturers Association; 2004.

H. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; National Electrical Manufacturers Association; 2006.

I. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

J. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2009.

K. UL 844 - Luminaires for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

L. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

M. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.

N. UL 1029 - High-Intensity-Discharge Lamp Ballasts; Current Edition, Including All Revisions.

O. UL 1598 - Luminaires; Current Edition, Including All Revisions.

P. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
   2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
   3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
   4. Notify ENGINEER of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 1999.

1.04 SUBMITTALS

A. Shop Drawings: Indicate dimensions and components for each fixture that is not a standard product of the manufacturer.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

E. Maintenance Materials: Furnish the following for OWNER's use in maintenance of project.
   1. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
   2. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.
   3. Extra Ballasts: Two percent of total quantity installed for each type, but not less than one of each type.

F. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Conform to requirements of NFPA 70 and NFPA 101.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting),

NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.07 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.08 WARRANTY

A. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

B. All lamps shall be certified as "Energy Saving".

C. Ballasts and lamps shall be non-PCB.

D. All lighting systems shall be provided/installed to meet applicable building codes (i.e. N.E.C, Life Safety Code NFPA 101, Energy Code, etc.).
   1. Contractor shall design/provide/install lighting controls (i.e. occupancy sensors, lighting relay control panels, photocells, etc.) as required to comply with the Michigan Energy Code.

1.09 SUBSTITUTION ITEMS REQUIRING PRIOR APPROVAL

A. All items that the CONTRACTOR proposes to use in the work, that are not specifically named in the contract documents, must be submitted for review/approval. Such items must be submitted in duplicate to the ARCHITECT and/or ENGINEER for approval a minimum of ten (10) days prior to bid opening. Requests for prior approval must be accompanied by complete catalog information, including but not limited to, model, size, accessories, complete electrical information and performance data in the form given in the equipment schedule on the drawings at stated design conditions. Where items are referred to by symbolic designations on the drawings, all requests for prior approval shall bear the same designations.

B. Lighting Substitutions:
   1. Furnish lighting fixtures as scheduled on drawings.
   2. Lighting fixture substitutions may be considered for approval by the ARCHITECT/ENGINEER only if all of the following criteria are met:
      a. Provide specification cut sheets marked-up to clearly identify the proposed luminaire including features, options, accessories, etc. required to match products indicated in the schedules.
      b. Provide detailed point-by-point lighting calculations for all areas proposed luminaire will be installed.
      c. Submit all cut sheets, calculations, etc. to the ARCHITECT/ENGINEER no less than 10 days prior to bid date. Substitutions submitted after this date will not be considered.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acuity Brands, Inc.: www.acuitybrands.com.

B. Cooper Lighting: www.cooperlighting.com.

C. Hubbell Lighting, Inc.: www.hubbelllighting.com.

D. Or as noted in lighting schedule on the drawings.

2.02 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.03 LUMINAIRES

A. Manufacturers:
   1. Acuity Brands, Inc.: www.acuitybrands.com.
   2. Cooper Lighting: www.cooperlighting.com.
   3. Hubbell Lighting, Inc.: www.hubbelllighting.com.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products that comply with requirements of NFPA 70 and NFPA 101.

D. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

E. Provide products complying with Federal Energy Management Program (FEMP) requirements.

F. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

G. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

H. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

I. Recessed Luminaires:
   1. Ceiling Compatibility: Comply with NEMA LE 4.
   2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
   3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

J. Fluorescent Luminaires:
   1. Provide ballast disconnecting means complying with NFPA 70 where required.
   2. Fluorescent Luminaires Controlled by Occupancy Sensors: Provide programmed start ballasts.
   3. Fluorescent Luminaires Controlled by Dual-Level Switching: Provide with two ballasts.
      a. Luminaires with Two Lamps: Each ballast controls one lamp.
      b. Luminaires with Three Lamps: One ballast controls two outer lamps and one ballast controls inner lamp.
      c. Luminaires with Four Lamps: One ballast controls two outer lamps and one ballast controls two inner lamps.

K. LED Luminaires: Listed and labeled as complying with UL 8750.

L. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.04 EMERGENCY LIGHTING UNITS

A. Manufacturers:
   1. Acuity Brands, Inc.: www.acuitybrands.com.
   2. Cooper Lighting: www.cooperlighting.com.
   3. Hubbell Lighting, Inc.: www.hubbelllighting.com.

B. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

C. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

D. Battery:
   1. Sealed maintenance-free lead calcium unless otherwise indicated.
   2. Size battery to supply all connected lamps, including emergency remote heads where indicated.

E. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

F. Provide low-voltage disconnect to prevent battery damage from deep discharge.

G. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

H. Where indicated, provide units with integral time delay to maintain emergency illumination for 15 minutes after restoration of normal power source.

I. Accessories:
   1. Provide compatible accessory mounting brackets where indicated or required to complete installation.
   2. Provide compatible accessory high impact polycarbonate vandal shields where indicated.
   3. Provide compatible accessory wire guards where indicated.
   4. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

J. Provide accessories and fittings as recommended by manufacturer to properly and completely install and wire fixtures.

K. Electrical Characteristics: 120 volts, 60 Hz, unless otherwise indicated.

2.05 LUMINAIRES

A. Furnish products as indicated in Schedule included on the Drawings.

2.06 EXIT SIGNS

A. Manufacturers:
   1. Acuity Brands, Inc.: www.acuitybrands.com.
   2. Cooper Lighting: www.cooperlighting.com.
   3. Hubbell Lighting, Inc.: www.hubbelllighting.com.

B. All Exit Signs: Internally illuminated with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single or double as indicated or as required for the installed location.
   2. Directional Arrows: As indicated or as required for the installed location.

C. Self-Powered Exit Signs:
   1. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
   2. Battery: Sealed maintenance-free nickel cadmium unless otherwise indicated.
   3. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
   4. Provide low-voltage disconnect to prevent battery damage from deep discharge.
   5. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

D. Self-Luminous Exit Signs: Internally illuminated by tritium gas sealed inside phosphor lined gas tubes, requiring no electrical power to operate, with a service life of 20 years unless otherwise indicated.

E. Accessories:
   1. Provide compatible accessory high impact polycarbonate vandal shields where indicated.
   2. Provide compatible accessory wire guards where indicated.

2.07 BALLASTS

A. Manufacturers:
   1. General Electric Company/GE Lighting: www.gelighting.com.
   2. Osram Sylvania: www.sylvania.com.
   3. Philips Lighting Electronics/Advance: www.advance.philips.com.
   4. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
   5. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. All Ballasts:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

C. Fluorescent Ballasts:
   1. All Fluorescent Ballasts: Unless otherwise indicated, provide high frequency electronic ballasts complying with ANSI C82.11 and listed and labeled as complying with UL 935.
      a. Inrush Current: Not exceeding peak currents specified in NEMA 410.
      b. Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 10 percent.
      c. Total Harmonic Distortion: Not greater than 20 percent.
      d. Power Factor: Not less than 0.95.
      e. Ballast Factor: Normal ballast factor between 0.85 and 1.15, unless otherwise indicated.
      f. Thermal Protection: Listed and labeled as UL Class P, with automatic reset for integral thermal protectors.
      g. Sound Rating: Class A, suitable for average ambient noise level of 20 to 24 decibels.
      h. Lamp Compatibility: Specifically designed for use with the specified lamp, with no visible flicker.
      i. Lamp Operating Frequency: Greater than 20 kHz, except as specified below.
         1) Do not operate lamp(s) within the frequencies from 30 kHz through 40 kHz in order to avoid interference with infrared devices.
      j. Lamp Current Crest Factor: Not greater than 1.7.
      k. Lamp Wiring Method:
         1) Instant Start Ballasts: Parallel wired.
         2) Rapid Start Ballasts: Series wired.
         3) Programmed Start Ballasts: Provide parallel or series/parallel wired where available; otherwise series wired is acceptable.
      l. Provide automatic restart capability to restart replaced lamp(s) without requiring resetting of power.
      m. Provide end of lamp life automatic shut down circuitry for T5 and smaller diameter lamp ballasts.
      n. Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category A.
      o. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 18, for Class A, non-consumer application.
      p. Ballast Marking: Include wiring diagrams with lamp connections.
   2. Non-Dimming Fluorescent Ballasts:
      a. Lamp Starting Method:
         1) T8 Lamp Ballasts: Programmed start unless otherwise indicated.
         2) T5 Lamp Ballasts: Programmed start unless otherwise indicated.

3) Compact Fluorescent Lamp Ballasts: Programmed start unless otherwise indicated.

b. Lamp Starting Temperature: Capable of starting standard lamp(s) at a minimum of 0 degrees F (-18 degrees C), and energy saving lamp(s) at a minimum of 60 degrees F (16 degrees C) unless otherwise indicated.

2.08 FLUORESCENT EMERGENCY POWER SUPPLY UNITS

A. Manufacturers:
1. Iota Engineering, LLC: www.iotaengineering.com.
2. Lithonia Lighting: www.lithonia.com.
3. Philips Emergency Lighting/Bodine: www.bodine.com.
4. Manufacturer Limitations: Where possible, for each type of luminaire provide fluorescent emergency power supply units produced by a single manufacturer.
5. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. Description: Self-contained fluorescent emergency power supply units suitable for use with indicated luminaires, complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

C. Compatibility:
1. Ballasts: Compatible with electronic, standard magnetic, energy saving, and dimming AC ballasts, including those with end of lamp life shutdown circuits.
2. Lamps: Compatible with low-mercury lamps.

D. Operation: Upon interruption of normal power source, solid-state control automatically switches connected lamp(s) to the fluorescent emergency power supply for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

E. Battery: Sealed maintenance-free high-temperature nickel cadmium unless otherwise indicated.

F. Emergency Illumination Output:
1. Luminaires with F32T8 Lamps: Operate two lamp(s) at a minimum of 1350 lumens unless otherwise indicated with indicated illumination evenly divided between the lamps.
2. Luminaires with F28T5 Lamps: Operate one lamp(s) at a minimum of 1325 lumens unless otherwise indicated.
3. Luminaires with F54T5HO Lamps: Operate one lamp(s) at a minimum of 1250 lumens unless otherwise indicated.

G. Diagnostics: Provide accessible and visible multi-chromatic combination test switch/indicator light to display charge, test, and diagnostic status and to manually activate emergency operation.

H. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status and field selectable audible alert.

I. Operating Temperature: From 32 degrees F (0 degrees C) to 122 degrees F (50 degrees C) unless otherwise indicated or required for the installed location.

J. Accessories:
1. Provide compatible accessory remote combination test switch/indicator light where indicated.

2.09 LAMPS

A. Manufacturers:
1. General Electric Company/GE Lighting: www.gelighting.com.
2. Osram Sylvania: www.sylvania.com.
3. Philips Lighting Company: www.lighting.philips.com.

4. Manufacturer Limitations: Where possible, provide lamps produced by a single manufacturer.
5. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. All Lamps:
1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the ENGINEER to be inconsistent in perceived color temperature.

C. Incandescent Lamps: Wattage and bulb type as indicated, with base type as required for lighting fixture; 130 V rated.
1. Reflector Type Incandescent Lamps: Beam pattern as indicated.
2. Non-Reflector Type Incandescent Lamps: Inside frosted lamp finish unless otherwise indicated.

D. Linear Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
1. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
2. T8 Linear Fluorescent Lamps:
   a. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
   b. Color Rendering Index (CRI): Not less than 80.
   c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.
3. T5 Linear Fluorescent Lamps:
   a. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
   b. Color Rendering Index (CRI): Not less than 80.
   c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.

2.10 ACCESSORIES

A. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

B. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 16138 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 500 (commercial lighting), and NECA 502 (industrial lighting).

D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

E. Suspended Ceiling Mounted Luminaires:
   1. Do not use ceiling tiles to bear weight of luminaires.
   2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
   3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members, or to building structure.
   4. Secure pendant-mounted luminaires to building structure.
   5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
   6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gage, connected from opposing corners of each recessed luminaire to building structure.
   7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

F. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.
   2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
   3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

G. Suspended Luminaires:
   1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
   2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
   3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet in length, with no more than 4 feet (1.2 m) between supports.
   4. Install canopies tight to mounting surface.
   5. Unless otherwise indicated, support pendants from swivel hangers.

H. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

I. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 and 502.

J. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.

K. Exposed Grid Ceilings: Support surface mounted luminaires in grid ceiling directly from building structure.

L. Install recessed luminaires to permit removal from below.

M. Install clips to secure recessed grid-supported luminaires in place.

N. Install wall mounted luminaires at height as indicated on Drawings.

O. Install accessories furnished with each luminaire.

P. Make wiring connections to branch circuit using building wire with insulation suitable for

temperature conditions within fixture; use flexible conduit.

Q. Connect luminaires to branch circuit outlets provided under Section 16138 using flexible conduit.

R. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

S. Bond products and metal accessories to branch circuit equipment grounding conductor.

T. Install specified lamps in each luminaire.

U. Emergency Lighting Units:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
   2. Install lock-on device on branch circuit breaker serving units.

V. Exit Signs:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
   2. Install lock-on device on branch circuit breaker serving units.

W. Fluorescent Emergency Power Supply Units:
   1. For field-installed units, install inside luminaire unless otherwise indicated. Where installation inside luminaire is not possible, install on top of luminaire.
   2. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal ballast(s) in luminaire. Bypass local switches, contactors, or other lighting controls.
   3. Install lock-on device on branch circuit breaker serving units.

X. Install lamps in each luminaire.

Y. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

Z. All night lights, emergency lights, and exit signs shall be circuited from the unswitched hot leg of the general lighting circuit for the area served by the night/emergency/exit lights.

AA. Coordinate location of emergency battery ballast unit remote test switch/charge light with Architect prior to rough-in.

AB. Remote mount battery packs for emergency ballasts in ceiling spaces above heated areas for outdoor emergency fixtures.

3.04 FIELD QUALITY CONTROL

A. See Section 01400 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by ENGINEER.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by ENGINEER. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of

egress path as required or as directed by ENGINEER or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by ENGINEER or authority having jurisdiction.

D. Aim and adjust fixtures as indicated.

3.06 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosures.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage.

3.07 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to ENGINEER, and correct deficiencies or make adjustments as directed.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

3.09 PROTECTION

A. Relamp luminaires that have failed lamps at Substantial Completion.

3.10 SCHEDULE - See Drawings

END OF SECTION

SECTION 16520

EXTERIOR LUMINAIRES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Lamps.

C. Luminaire accessories.

1.02 REFERENCE STANDARDS

A. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals; American Association of State Highway and Transportation Officials; 5th Edition, 2009.

B. ANSI C82.1 - American National Standard for Lamp Ballast - Line Frequency Fluorescent Lamp Ballast; 2004.

C. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low Pressure Sodium Lamps (Multiple-Supply Type); 2002.

D. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; Consolidated-2002.

E. ANSI O5.1 - American National Standard for Wood Poles -- Specifications and Dimensions; 2008.

F. IEEE C2 - National Electrical Safety Code; 2007.

G. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (R2008).

H. IESNA LM-64 - Photometric Measurements of Parking Areas; 2001.

I. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

J. NECA/IESNA 501 - Recommended Practice for Installing Exterior Lighting Systems; 2006.

K. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Fluorescent Ballasts; National Electrical Manufacturers Association; 2004.

L. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; National Electrical Manufacturers Association; 2006.

M. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

N. UL 844 - Luminaires for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

O. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.

P. UL 1029 - High-Intensity-Discharge Lamp Ballasts; Current Edition, Including All Revisions.

Q. UL 1598 - Luminaires; Current Edition, Including All Revisions.

R. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
   2. Notify ENGINEER of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.04 SUBMITTALS

A. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
   1. Lamps: Include rated life and initial and mean lumen output.
   2. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

C. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

F. Maintenance Materials: Furnish the following for OWNER's use in maintenance of project.
   1. See Section 01600 - Product Requirements, for additional provisions.
   2. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.
   3. Extra Ballasts: Two percent of total quantity installed for each type, but not less than one of each type.
   4. Extra Fuses: Five percent of total quantity installed for each type, but not less than two of each type.
   5. Touch-Up Paint: 2 gallons (8 liters), to match color of pole finish.

G. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.

C. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

D. All lighting systems shall be provided/installed to meet applicable building codes (i.e. N.E.C, Life Safety Code NFPA 101, Energy Code, etc.).
   1. Contractor shall design/provide/install lighting controls (i.e. occupancy sensors, lighting relay control panels, photocells, etc.) as required to comply with the Michigan Energy Code.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written

instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

C. Receive, handle, and store wood poles in accordance with ANSI O5.1.

1.07 COORDINATION

1.08 SUBSTITUTION ITEMS REQUIRING PRIOR APPROVAL

A. All items that the CONTRACTOR proposes to use in the work, that are not specifically named in the contract documents, must be submitted for review/approval. Such items must be submitted in duplicate to the ARCHITECT and/or ENGINEER for approval a minimum of ten (10) days prior to bid opening. Requests for prior approval must be accompanied by complete catalog information, including but not limited to, model, size, accessories, complete electrical information and performance data in the form given in the equipment schedule on the drawings at stated design conditions. Where items are referred to by symbolic designations on the drawings, all requests for prior approval shall bear the same designations.

B. Lighting Substitutions:
   1. Furnish lighting fixtures as scheduled on drawings.
   2. Lighting fixture substitutions may be considered for approval by the ARCHITECT/ENGINEER only if all of the following criteria are met:
      a. Provide specification cut sheets marked-up to clearly identify the proposed luminaire including features, options, accessories, etc. required to match products indicated in the schedules.
      b. Provide detailed point-by-point lighting calculations for all areas proposed luminaire will be installed.
      c. Submit all cut sheets, calculations, etc. to the ARCHITECT/ENGINEER no less than 10 days prior to bid date. Substitutions submitted after this date will not be considered.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acuity Brands, Inc.: www.acuitybrands.com.

B. Cooper Lighting: www.cooperlighting.com.

C. Hubbell Lighting, Inc.: www.hubbelllighting.com.

D. Or as noted in lighting schedule on the drawings.

2.02 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the Drawings.

2.03 LUMINAIRES

A. Manufacturers:
   1. Acuity Brands, Inc.: www.acuitybrands.com.
   2. Cooper Lighting: www.cooperlighting.com.
   3. Hubbell Lighting, Inc.: www.hubbelllighting.com.

B. Provide products that comply with requirements of NFPA 70.

C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

D. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

E. Provide products complying with Federal Energy Management Program (FEMP) requirements.

F. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

G. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

H. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

I. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

J. Hazardous (Classified) Location Luminaires: Listed and labeled as complying with UL 844 for the classification of the installed location.

K. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

L. LED Luminaires: Listed and labeled as complying with UL 8750.

M. Exposed Hardware: Stainless steel.

2.04 BALLASTS

A. Manufacturers:

B. All Ballasts:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

C. Fluorescent Ballasts: ANSI C82.1, high power factor type electromagnetic ballast, suitable for lamps specified.
   1. Provide low-temperature ballast suitable for lamps specified.
   2. Voltage: Match luminaire voltage.
   3. Certify fluorescent ballast design and construction by Certified Ballast Manufacturers, Inc.

2.05 LAMPS

A. Manufacturers:
   1. General Electric Company/GE Lighting: www.gelighting.com.
   2. Osram Sylvania: www.sylvania.com.
   3. Philips Lighting Company: www.lighting.philips.com.
   4. Manufacturer Limitations: Where possible, provide lamps produced by a single manufacturer.
   5. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. All Lamps:
   1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
   2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
   3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
   4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the ENGINEER to be inconsistent in perceived color temperature.

C. Incandescent Lamps: Wattage and bulb type as indicated, with base type as required for lighting fixture; 130 V rated.

D. Linear Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.

E. Lamp Types: As specified for each luminaire.
   1. Note: All lamps for exterior lighting operating at more than 100 watts shall have lamps with a minimum efficacy of 60 lm/W.

2.06 POLES

A. As specified on the drawings.

B. Manufacturers:

C. All Poles:
   1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
   2. Structural Design Criteria:
   3. Material: Aluminum, unless otherwise indicated.
   4. Shape: Square straight, unless otherwise indicated.
   5. Finish: Match luminaire finish, unless otherwise indicated.
   6. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
   7. Unless otherwise indicated, provide with the following features/accessories:

D. Metal Poles: Provide ground lug, accessible from handhole or transformer base.

2.07 ACCESSORIES

2.08 COMPOSITE HANDHOLES

A. Manufacturer:
   1. Quazite.

B. Composite handholds shall be constructed of polymer concrete and reinforced by a heavy weave fiberglass. The handholes shall have internal dimensions not less than that indicated. The material shall have the following properties:
   1. Compressive strength: 11,000 PSI; Tensile strength: 1,700 PSI; Flexural strength: 7,500 PSI.

2.09 STANDARD LIGHTING FOUNDATIONS

A. Construct foundations of reinforced concrete as indicated on the drawings complete with anchors, conduit, and grounding.

PART 3 EXECUTION

3.01 EXAMINATION

3.02 PREPARATION

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 16138 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship) and NECA/IESNA 501 (exterior lighting).

D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

E. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

F. Install accessories furnished with each luminaire.

G. Bond products and metal accessories to branch circuit equipment grounding conductor.

H. Install poles plumb.
   1. Provide double nuts to adjust plumb.
   2. Grout around each base.

I. Install lamps in each luminaire.

J. Bond luminaires, metal accessories, and metal poles to branch circuit equipment grounding conductor. Provide supplementary grounding electrode at each pole.

K. All night lights, emergency lights, and exit signs shall be circuited from the unswitched hot leg of the general lighting circuit for the area served by the night/emergency/exit lights.

L. Coordinate location of remote test switch/charge light with architect prior to rough-in.

M. Remote mount battery packs for emergency ballasts in ceiling spaces above heated areas for outdoor emergency fixtures.

3.04 CONCRETE WORK FOR ELECTRICAL WORK

A. Provide materials and labor for concrete work including concrete, forming, pouring and reinforcing for lighting standard foundations. Use concrete having a minimum compressive strength of 4000 psi in 28 days, unless otherwise indicated. Use air-entrained concrete for applications exposed to the weather.

3.05 FIELD QUALITY CONTROL

A. See Section 01400 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by ENGINEER.

E. Measure illumination levels at night with calibrated meters to verify conformance with performance requirements. Record test results in written report to be included with submittals.

F. Measure illumination levels to verify conformance with performance requirements. Take measurements during night sky, without moon or with heavy overcast clouds effectively obscuring moon.

3.06 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by ENGINEER. Secure locking fittings in place.

B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by ENGINEER.

C. Aim and adjust luminaires to provide illumination levels and distribution as directed.

3.07 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosure.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage.

3.08 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to ENGINEER, and correct deficiencies or make adjustments as directed.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.09 PROTECTION

3.10 SCHEDULE - See Drawings

END OF SECTION

Otsego County Structured Wiring
Structured Wiring Bid Specifications
April 6, 2011

1. Objective

The objective of this project is to install new category 6E cable, install new coaxial cable for cable television and interconnect the Telco Demarc with the Data Closet using 25 Pair copper, and CAT 6E Copper. This project may be completed during several project phases and require coordination with other trades throughout each phase. See attached drawings for the required cabling locations and project specifics. When the project is complete the UTP cabling will be a flexible system allowing simple conversion between data or voice.

2. UTP Category 6E Cabling infrastructure requirements

The cabling infrastructure for the facility will be an end-to-end Category 6E (Horizontal) non-plenum unshielded cabling system and must adhere to the TIA/EIA 568-B standards. The MDF (#118) and Mechanical Room (#124) will be connected utilizing Four (4) Category 6E copper and one (1) 25 Pair copper cables . The proposed cable infrastructure must also be housed in cable trays, j-hooks or conduit for all horizontal cable runs and installed in accordance with network cabling standards to avoid electrical interference hazards.

All exposed interior cables shall be protected from physical damage by installing in a wireway approved by the contracting officer for that location.

All exposed exterior cables shall be protected from physical damage by installing in a raintight conduit system.

Trunk Cables: Cables providing connectivity between MDF #118 and Mechanical Room #124 shall be of a distinctive color (WHITE, BRIGHT GREEN, ORANGE, PINK).

Station Cables: Cables between MDF and Work Areas shall be blue and rated for 1Gb Ethernet.

Installation - All wiring and wiring component installation shall meet the requirements of ANSI/TIA/EIA and BICSI TDM, CAT6E/6A installation procedures, and all applicable manufacturer installation requirements. The maximum cable length between the MDF/IDF to Office/Resident room outlet box shall not exceed 90 m (295 ft).

3. Coaxial Cable

The coaxial network should utilized industry standards for low-loss in-building (digital and analog) television distribution. Contractors may provide a bid for a home-run or Trunk-Tap solution. It is the responsibility of the contractor to select the appropriate method for this building. Cost and design parameters will be considered in when reviewing final bids. All coaxial cable can be non-plenum rated. If taps are used, client preferred amplifier/tap solutions from www.blondertongue.com.

4. 25 Pair Cable from Room #124 to #118

Voice Grade 25 pair cable (CAT-3 or CAT-5) will be run from the Mechanical Room #124 to MDF Closet #118. This will be used to patch voice circuits to the local TELCO. At each end they shall be terminated to a Hubbell Part#HPW66M150. 10 foot services loops (not coiled) will be maintained at each closet.

5. Wire Management Hardware

Cable hooks, and mounting bases, brackets, clips, and other similar devices to provide support or bundling for cables shall be screw or otherwise permanently mounted. Glue mounted devices are not allowed. Zip ties of any kind will not be allowed on any cabling. Use Velcro straps

6. Relay Racks – Hubbell Part #HPW84RR19

The telecommunications connecting hardware shall be floor rack mounted according to individual site requirements.

Floor mount equipment racks must be bolted to the floor by means of unistrut or concrete lag bolts, and anchored on top to "Ladder Rack" below. Allow for 40" wide, 40"depth, and 7.5 ft high for each equipment rack.

Provide space for an aisle of at least 3 ft wide in the front and in the rear of the space allocated for each floor mounted equipment rack or cabinet. Provide space for an aisle of at least 3 ft wide measured when the rack is opened to allow access to the rear of each wall mounted equipment rack.

7. Relay Racks Cable Management

Ladder Rack: Cabling Contractor to supply ladder rack in MDF as indicated on drawing(s)

Hubbell Part #VS76H When the rack is mounted with one side against the wall, a clearance of 6" shall be maintain and the vertical cable management shall be installed on the non-wall side of the rack. Qty 1 required

8. General Instructions to Wiring Contractor
:

All extra components delivered with required materials shall be provided to owner for future use. (e.g. rack mount washers/screws, faceplate labels, patch panel stuffer caps etc..)

Hubbell product numbers listed are required items. No substitutions will be accepted without written approval by the owner.

All Category 6 UTP MDF/IDF Station terminations will be to Hubbell Category 6E RJ45

<u>Patch Panels.</u>

Hubbell Category 6E Patch Panel 24 Port Part #P6E24U
Hubbell Category 6E Patch Panel 48 Port Part #P6E48U

10 foot services loops (not coiled) will be maintained at each wiring closet with storage being placed in the ladder rack above in each MDF/IDF. All UTP wiring closet terminations will be performed in a logical sequential order corresponding to the layout of the building.

<u>Wall Jacks</u>

8 position Hubbell Category 6E Jacks Orange: Mfg Part #HXJ6OR

8 position Hubbell Category 6A (10G) Jacks Red: Mfg Part #HJ6AR
6 position Hubbell USOC Jacks Color TBD Mfg Part #HXJUxx
Where xx is: EI (Ivory) or W (White)
Hubbell Snap-Fit F-Connectors; Color TBD Mfg Part #SFFnn
Where xx is: EX (Ivory) or WX (White)

Horizontal installation cable runs shall be in cable trays, conduit or j-hooks as required;

1. Tie wraps will not be accepted in any aspect of the project
2. Velcro straps shall be used to bundle cables.
3. If J-hooks are used they shall be spaced no further than every four (4) feet.

Wall jacks in the new building will be in 4x4x2-1/8" boxes with single gang mud rings and conduit stubbed to the ceiling cavity or floor conduit as appropriate. The electrical contractor will install the 4x4 deep boxes and conduit for each data and video drop in the new building.

Station Cables: Testing of all RJ-45 jacks, patch panels and UTP cabling in conformance with ANSI/TIA/EIA-568B standards for 4 pair category 6 at 1000Mb (1Gb)

Trunk Cables: Testing of all RJ-45 jacks, patch panels and UTP cabling in conformance with ANSI/TIA/EIA-568B standards for 4 pair category 6 at 1000Mb (1Gb)

9. **Firestopping** - The methods, materials, and considerations for reestablishing the integrity of fire-rated architectural structures and assemblies, required by building codes must be observed when these barriers are penetrated by cables, pathways, or other penetrating elements.

   Coordinate each firestop selection with adjacent work for dimensional or other interference and for feasibility. In areas accessible to the public and other finished areas, firestop systems work shall be selected, installed, and finished to the quality of adjacent surfaces of building construction being penetrated.

   Use materials without irritating or objectionable odors when firestopping is required in existing buildings and areas that are occupied.

   Provide damming materials, plates, wires, restricting collars, and devices necessary for the installation of firestopping. Remove combustible installation aids after firestopping material has cured.

   All firestops shall be installed in accordance with the manufacturer's instructions in order to maintain the specific rating assigned.

   Firestopping must be inspected by the Contracting Officer or other designated Government official. If firestopping is exposed for inspection as directed by the inspecting authority to permit his or her inspection, reinstall new firestopping and restore work where removed for inspection. This requirement exists because firestopping is often installed when an inspecting official is not available.

10. Labeling

All UTP jacks will be labeled according to the following standards
Label → PJJ
RRR-NN

Where:
P = Patch Panel Number in IDF/MDF Rack (1-9)

JJ = Patch Panel Jack Number (01 – 48)
RRR = Room Number
NN = Jack Number sequential for each room

11. **Materials**

Vendor is to provide all materials necessary for the successful completion of the project. The identification of specific materials in this document or in attached lists is meant to identify specific manufacturer products mandated by the owner. It is NOT intended as a complete list of materials necessary for successful completion. In general terms, the cabling contractor is expected to provide, cabling, fiber, jacks, patch panels, relay-racks, faceplates. However the contractor is not generally expected to provide 4x4 wall boxes, conduit, cable tray, plywood backer-boards.

12. Warranty and Certifications

Contractor must be Hubbell Certified and provide a Hubbell Certification certificate. Contractor must provide to OWNER a manufacturer's warranty certificate for a twenty five (25) year warranty on all Hubbell copper cable plant infrastructure installed as a part of this project.

13. As-Builts

As-built drawings document the installed telecommunications infrastructure. The As Built drawings and test-results must be delivered to the IT Project Manager prior to the conclusion of the project. The drawings must be delivered in both CAD and PDF formats.

As built drawings are site specific and will have identifiers assigned to key elements. There may be separate drawings (layers) for other portions of the infrastructure such as pathways and spaces depending on how complex the installation is.

Drawings shall include:

- All IDF and MDF rooms
- Plan and elevation views of all IDF and MDF rooms
- Show major pathways of cable runs
- Equipment closets
- Locations of conduit pull boxes
- Wall penetrations
- The location of all cable terminations
- The location of all backbone cables
- The jack number shall appear on the drawing
- The location of all telecommunications outlets on the floor plans

14. Project Specifics

11 Wall Locations (FUTURE)
4 Wall Locations (1 Voice, 1 Data)
2 Wall Locations (1 Voice, 2 Data)
1 Wall Mount Telephone Location (FUTURE)
3 Interior IP Camera (1 Data)
5 Exterior IP Camera (1 Data)

Data cabling for both interior and exterior IP Cameras shall be terminated to a surface mounted box secured above the drop ceiling. When a drywall ceiling is used the data jack shall be terminated to a standard single gang receptacle similar to a wall jack.

Please direct all questions regarding this document to:

Eric D. Seelye
Empiric Solutions, Inc.
231-348-1035

Please identify “Otsego County Animal Control”.

Telecommunications Requirements

Other trades (Electrical/Mechanical/Finish)

Prepared by: Eric Seelye
Empiric Solutions, Inc.
PO Box 58
Petoskey, MI 49770
231-348-1035

Grounding / Ground Bars

Grounding - Grounding shall be per the NEC, local codes, and the additional requirements in ANSI-J607-A-2002 and installed by a licensed electrician. When there is a code conflict the most stringent requirement shall be followed.

1. **Telecommunications Grounding and Bonding System (TGMB)** – Install within 5 feet of the main electrical service of any building with more than one of any of the following: MDF, IDF. Bond to the electrical service with a TBB. The TGMB and TBB's shall be protected from damage, tampering and the weather.

2. **Telecommunications Bonding Busbar (TGB)** – Install one in each Entrance Facility, MDF, IDF in the center of one of the backboards. Ground to the TGMB if installed for this building or directly to the main electrical service for the building when a TGMB is not installed with a TBB.

3. **Isolated Ground Busbar –** Install one on the backboard not containing the TGB and connect to the TGB with a #8 AWG copper conductor.

4. **Telecommunications Bonding Backbone (TBB)** – Minimum #6 AWG up to maximum 3/0AWG, size according to NEC grounding electrode conductors and any additional requirements in ANSI-J-STD-607-A.

Where there is a load center co-located in the same room as telecomm equipment, this load center shall be bonded to the ground bar in addition to the load centers normal grounding path.

All protection devices, frames, racks, cabinets, and telephone and data equipment shall be bonded to the TGB according to NEC, and the additional requirements in ANSI/TIA/EIA-607, Commercial Building Grounding and Bonding Requirements for Telecommunications. When compatible or more stringent than code, follow grounding instructions of the equipment manufacturer.

Grounding paths to the ground bar shall be kept short (under 1 meter (3.3 ft), install additional isolated ground bars as needed). **Do not form ground loops**.

Electrical Circuits in MDF / IDFs

IDFs shall contain one dedicated 20-amp circuit and two duplex 20-amp rated receptacles in a double gang box. These shall be on Generator Power (when applicable). Use dedicated wiring: No shared neutrals!

MDF shall contain two dedicated 20-amp circuits on separate phases and two duplex 20-amp rated receptacles per circuit in double gang boxes. These shall be on Generator Power (when applicable). Use dedicated wiring: No shared neutrals!

Each IDF and the MDF shall contain at least one duplex receptacle connected to a general building receptacle circuit for cleaning. Label "General Use Receptacle – for cleaning equipment etc."

Electrical Boxes and Conduit

Office Areas: Wall outlet boxes shall be 4"x4"x2-1/8" with single gang mud rings. These shall be installed for all voice, data, and video jacks.

Office Area: A 3/4" minimum EMT conduit shall run from each Outlet Box, through the wall, to accessible locations above the ceiling or below the floor. The conduit shall terminate horizontally, above or below all obstructions and be readily accessible, directed toward the horizontal pathway. Conduit shall have plastic/nylon protective grommets installed to protect cabling from sharp metal edges. Larger conduit sizes may be required in some locations. Please review project details and size conduit to accommodate the requested number of cables (+2). This means increase the size of the conduit or install an additional conduit to allow for later installation of at least two additional CAT-6 Cables with a diameter of 7.4mm (0.29") without exceeding BICSI fill capacities (see attached Conduit Fill Capacity Table).

~~Cooling~~

~~**MDF / Computer Room – HVAC** shall be installed and designed to function properly 24 hours per day, 365 days per year and sized to maintain a temperature from 18º C (64º F) to 24º C (75º F), and relative humidity 30% to 55% connected to the emergency power source. Use 14KW for BTU calculations. HVAC sensors shall be located in the room and placed 1.5 m (5 ft) AFF. The daily average expected equipment heat dissipation is 12,000 BTU/hr . With additional equipment we expect a maximum 20,000 Btu/hr.~~

Avoidances

Proximity to Water Lines – Water lines and associated equipment (not including any required fire suppression system) shall be separated from MDF, IDFs, and Computer Rooms by one of the following:

1. A minimum of two wall partitions. A Four Post Rack Enclosure may count as one wall.
2. A minimum of one wall and 4.5 m (15 ft) measured horizontally. From the nearest point on that wall.
3. Other protection or separation methods approved in writing by the Contracting Officer before building approval.

MDF / IDF Rooms

Backboards - The backboards for the MDF and IDFs shall be ¾ inch thick, type ACX fire retardant plywood, covered with two coats of fire retardant paint, and minimum area of 4 ft x 8 ft

MDF Backboards - Shall be installed on at least 2 walls.

Floor Requirements - Shall be non-conductive vinyl or ceramic tile and shall be installed with the appropriate non-conductive adhesive and grout.

Wireways

Pathways - Provide cable trays, wire basket support systems, j-hooks, d-rings, and/or other wire ways above the ceiling or below the floor for telephone CAT-6, Fiber, video, and fire alarm cabling for all main corridors ***(implied corridors in open office areas and/or partitioned corridors)***, i.e. from MDF/IDFs to the Office Areas and sized in accordance with NEC, ANSIEIA/TIA 568B and 569 specs and NEMA VE-2. The system is for exclusive use by the trades listed in this paragraph. Other trades must provide their own pathway. The type and location of wire ways shall be determined during the building design in accordance to NEC and the additional requirements of NEMA VE-1.

1. The tray/basket type support capacity shall be determined in accordance with the manufacturer's maximum recommended load capacity. A 50% fill capacity shall not be exceeded, and, cables shall be stacked no higher than 6". Conduits shall be sized per the Conduit Sizing (attached).

2. If the pathway is in the ceiling, allow for 12"of clear vertical space above the tray/basket type systems and 6 inches between the suspended ceiling and the cabling pathways. If the building does not have a suspended acoustical ceiling with access to plenum and trays, a minimum of one access point per room must be provided

3. Bond metal pathway systems to the telecommunications grounding and bonding system. Space at least 12" from trays of other systems. Access must be provided between floors for the connection of the support system. The horizontal pathway placement shall be coordinated between the various trades that use the space.

4. These support systems shall contain only telecommunication cable, electrical cable is not allowed to be placed in the same systems.

5. Ladder Rack to be provided by cabling contractor. Note: Equipment Racks specified are 84" tall 19" wide racks Hubbell Part# HPW84RR19

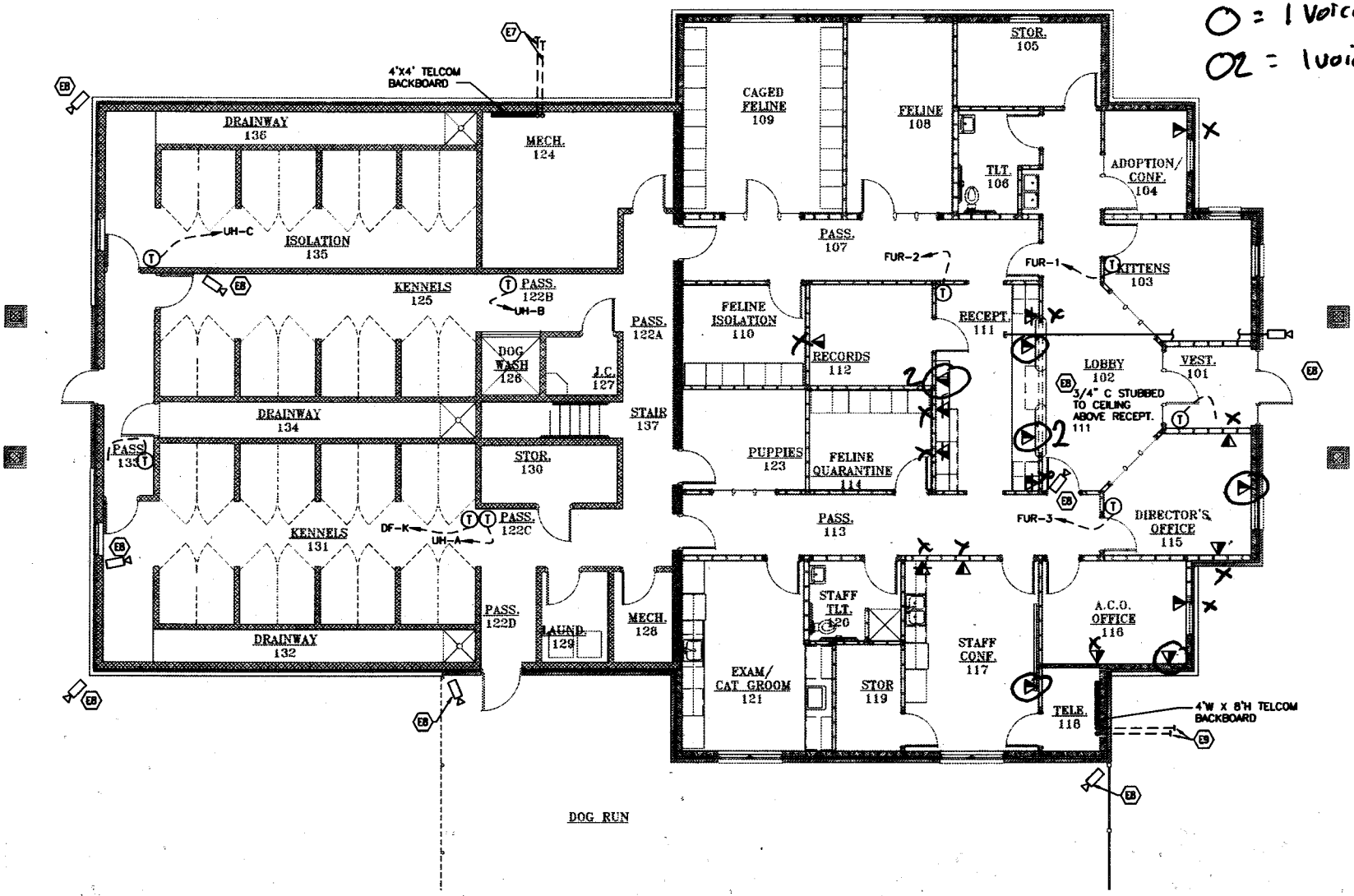
Conduit – Recommended conduit: Intermediate Metal Conduit (IMC), Rigid Metal Conduit (RMC), Electrical Metallic Tubing (EMT).

Cable Trays and Ladder Racks – Includes listed factory manufactured tees, crosses, risers, elbows and other fittings of the same material as the main sections.

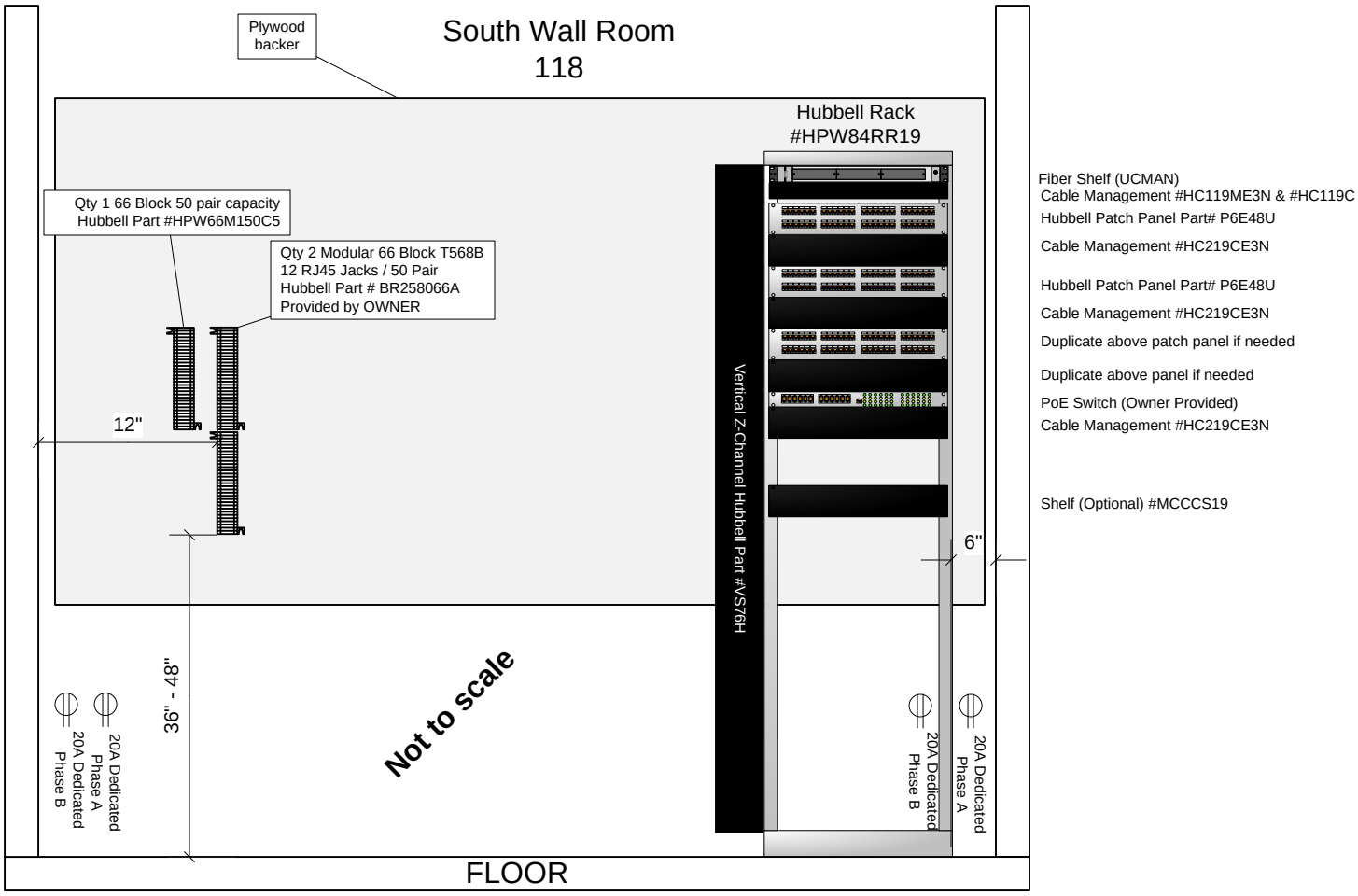
Wire Basket Support System – Listed straight sections of continuous wire mesh, field formed horizontal and vertical bends, tees, drop outs, supports and accessories. Cooper B-line Wire Basket Runway or equivalent.

NOTE CABLE TRAY HAS NOT BEEN SPECIFIED FOR OTSEGO COUNTY ANIMAL CONTROL

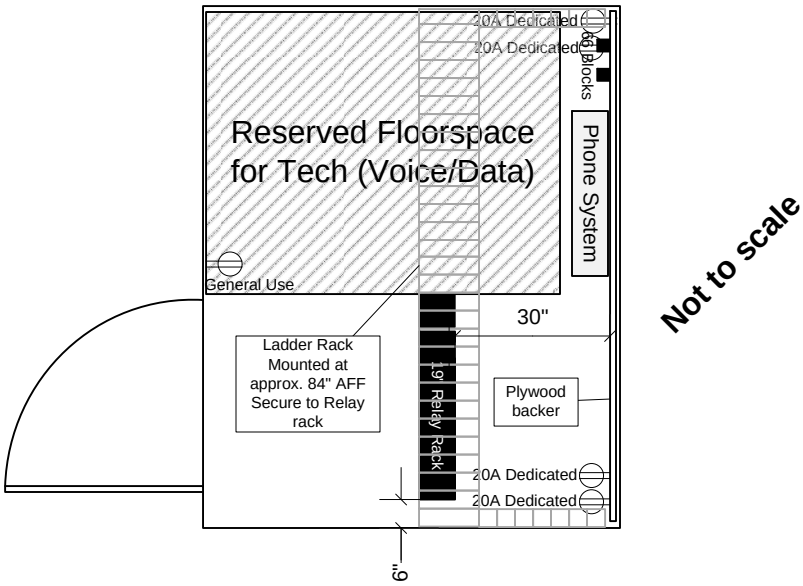
X = Future
O = 1 Voice 1 Data
O2 = 1 voice 2 data



Otsego County Animal Control
Typical MDF Elevation and floorplan



MDF Room 118 Layout



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Prepared by: Eric D. Seelye | rev. 6 Apr, 2011 at 15:57

Section 31 1100
Clearing and Grubbing

Part 1 General

1.01 Scope of Work

A. This section includes all clearing and grubbing work indicated on the Plans and as required, complete with cutting and removal of trees, shrubs, vegetation, stumps, logs, brush, roots and undergrowth, and disposal of materials.

1.02 Related Work Specified Elsewhere

A. Section 31 2199: Temporary Erosion and Sediment Control
B. Section 312198: Site Construction Performance Requirements
C. Section 31 2200: Grading
D. Section 31 2313: Subgrade Preparation

1.03 Soil Erosion and Sedimentation Control

A. CONTRACTOR, at his expense, shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by ENGINEER.

B. Measures shall prevent surface runoff from carrying excavated materials into the waterways, to reduce erosion of the slopes, and to prevent silting in of waterways downstream of the Work.

C. Measures should include provisions to reduce erosions by the wind of all areas stripped of vegetation, including material stockpiles.

D. Comply with requirements of Section 31 2199, Temporary Erosion and Sediment Control.

Part 2 Products (Not Used)

Part 3 Execution

3.01 Clearing

A. Trees, stumps, brush, hedges, and other vegetation occurring within the contract limits as defined on the Plans or as directed by ENGINEER shall be cut off flush with the ground and shall be completely removed.

3.02 Clearing and Grubbing

A. Trees, stumps, brush, shrubs, hedges, roots, corduroy, logs, matted roots, other vegetation and debris occurring within the contract limits as defined on the Plans or as directed by ENGINEER, shall be completely removed. Depth of removal shall be in accordance with Article 3.04 or 3.05.

B. Selective clearing shall consist of removing and disposing of dead, diseased, poorly formed, or otherwise undesirable trees, undergrowth, stumps, uprooted trees and debris. Trees to be removed will be marked and the area where the undergrowth is to be removed will be indicated on the Plans or designated by ENGINEER.
   1. Selective Clearing, Type I:

a. Trees and stumps shall be cut off at an elevation not more than four (4) inches (100 mm) above the existing ground level.

2. Selective Clearing, Type II:

a. Trees and stumps shall be chipped or ground down to an elevation approximately four (4) inches (100 mm) below proposed ground level.

3.03 Depth of Removal in Excavation Area

A. For excavation areas within roadways, parking lots, and other paved areas, the trees, stumps, and roots shall be removed to a depth of not less than 12 inches (300 mm) below the subgrade elevation.

B. In all other excavation areas, the trees, stumps, and roots shall be removed to a depth of not less than 12 inches (300 mm) below the finish surface elevation, or as indicated on the Plans or as designated by ENGINEER.

3.04 Depth of Removal in Embankment Areas

A. Within embankment areas for roadways, parking lots, and other paved areas where the top of road material is five (5) feet (1.5 m) or less in height above the existing ground, the trees, stumps, and roots shall be removed to a depth of not less than 12 inches (300 mm) below the existing ground.

B. Within embankment areas for roadways, parking lots, and other paved areas where the top of road material is more than five (5) feet (1.5 m) in height above existing ground, the trees and stumps shall be cut off flush with the existing ground surface.

C. For embankment areas other than roadways, parking lots, and other paved areas, the trees and stumps shall be cut off flush with the existing ground surface, or as indicated on the Plans or as designated by ENGINEER.

3.05 Removal of Trees, Stumps, and Other Vegetation

A. Where trees cannot be felled without danger to traffic or injury to other trees, structures or property, they shall be cut down in sections.

B. Removal of stumps and roots may be accomplished by the use of a shredding machine meeting the approval of ENGINEER.

3.06 Removing Corduroy

A. Logs, stumps, poles, brush, and other unsatisfactory material occurring in the contract limits at or below the surface of the ground and within the depth of four (4) feet (1.2 m) below the proposed plan grade shall be removed and shall be disposed of by the CONTRACTOR.

B. When material is disposed of outside of the contract limits, disposal shall be as specified in Section 31 2198, Site Construction Performance Requirements.

C. Burial of trees, stumps and other vegetation, will not be permitted, except at disposal areas indicated on the Plans or as determined by ENGINEER. Trees and stumps buried in these areas shall have a minimum cover of two (2) feet (0.6 m).

3.07 Holes and Trenches

A. Holes and trenches remaining after the clearing or grubbing operations in embankment areas, shall have the sides broken down or leveled, and shall be refilled with acceptable material.

1. Material shall be moistened and properly compacted in layers by tampers or rollers to the density required under roadways, parking areas, and other special areas, as determined by ENGINEER.

2. The same construction procedure shall be applied to all holes and trenches remaining in excavation areas where the depth of holes exceeds the depth of proposed excavation.

3.08 Salvaging Timber

A. Trees required to be removed and having a diameter of four (4) inches (100 mm), or more, are classed as merchantable timber. On right-of-way, fee simple, merchantable timber shall become the property of CONTRACTOR, unless otherwise specified in the Contract Documents. When such material is placed outside of the right-of-way, CONTRACTOR shall obtain and provide ENGINEER with written permission from owner of the property on which the timber is to be placed.

B. Merchantable timber to be removed from areas outside of right-of-ways, fee simple, shall be cut and piled for the use of property owner, except where CONTRACTOR provides ENGINEER with a written agreement from the property owner that he does not desire the salvaged timber. Where the property owner has signed such an agreement, the salvaged timber will become the property of CONTRACTOR.

C. When such material is placed outside the contract limits, CONTRACTOR shall obtain and provide ENGINEER with written permission from the owner of the property on which the timber is to be placed. Timber from 4 to 12 inches (100 to 300 mm) in diameter may be left in full tree lengths or cut to commercial lengths, at the option of CONTRACTOR. Timber 12 inches (300 mm), or more, in diameter shall be cut into commercial lengths and piled separately from other timber.

End of Section

Section 31 2198
Site Construction Performance Requirements

Part 1 General

1.01 Scope of Work

A. This Section includes general performance requirements for earthwork complete with, reimbursement for crop damage, removal and disposal of structures and obstructions, protection of existing sewers, tiles and mains; protection of existing building and improvements, protection of trees and other types of vegetation, protection of utility lines, requirements for pavement replacement, restoration of driveways and parking areas, restoration of sidewalks, restoration of lawns and disturbed areas, transportation, and disposal of excess excavation.

1.02 Related Work Specified Elsewhere

A. Section 31 2199: Temporary Erosion and Sediment Control
B. Section 31 2200: Grading
C. Section 31 2313: Subgrade Preparation
D. Section 31 2319: Dewatering
E. Section 31 2316: Structural Excavation and Backfill
F. Section 31 2333: Trenching and Backfilling
G. Section 32 1216: Bituminous Paving
H. Section 32 1313: Concrete Paving
I. Section 32 1315: Sidewalks and Driveways
J. Section 32 9219: Seeding
K. Section 32 9223: Sodding

1.03 Reference Standards

A. Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

1. MDOT - Michigan Department of Transportation Standard Specifications for Construction, 2003.

1.04 Requirements of Regulatory Agencies

A. CONTRACTOR shall comply with Section31 2199, Temporary Erosion and Sediment Control. CONTRACTOR, at his expense, shall secure all permits, and post all bonds or deposits required to comply with the "Soil Erosion and Sedimentation Control," requirements, being Part 91 of PA 451 of 1994 as amended.

B. CONTRACTOR shall comply with all requirements of the National Pollutant Discharge Elimination System (NPDES) Storm Water Program for Construction Activities, Part 31 of PA 451 of 1994 as amended.

C. CONTRACTOR shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by ENGINEER.

1. Measures shall prevent surface runoff from carrying excavated materials into the waterways, to reduce erosion of the slopes, and to prevent silting in of waterways downstream of the Work.

2. Measures should include provisions to reduce erosion by the wind of all areas stripped of vegetation, including material stockpiles.

1.05 Submittals

A. Written permission for the use of all disposal and borrow sites shall be obtained and copies shall be furnished to ENGINEER.

1.06 Protection of Plant Life

A. Trees, shrubs, and other types of vegetation not within the limits of the Work or not designated on the Plans or by ENGINEER to be removed, shall be carefully protected from damage or injury during the various construction operations.

B. Any tree, shrub or other type of vegetation not designated to be removed but which is damaged by CONTRACTOR's operation shall be repaired or replaced by CONTRACTOR, at his expense, as determined by ENGINEER.

1.07 Protection of Existing Structures and Improvements

A. existing culverts, sewers, drainage structures, manholes, water gate wells, hydrants, water mains, utility poles, overhead lines, underground conduits, underground cables, pavement, or other types of improvements within the construction limits, not designated on the Plans to be removed, shall be carefully protected from damage during the construction operations.

B. Existing structure or improvement not designated to be removed, but which is damaged by CONTRACTOR's operations shall be repaired or replaced by the CONTRACTOR, to the satisfaction of the owner, at his expense.

C. Deposits of dirt or debris in sewers, culverts, tiles, drainage structures, manholes, gate wells, etc. caused by CONTRACTOR shall be cleaned out at the CONTRACTOR’s expense.

1.08 Maintaining Drainage

A. Existing open drains, field and roadway ditches, drainage tile, sewers, enclosed drains, natural and artificial watercourses, surface drainage or any other types of drainage within the limits of the Work shall be maintained and free to discharge during construction.

B. Drainage facility not designated to be abandoned, but which is damaged, or any drainage interrupted by the CONTRACTOR's operation shall be immediately repaired, replaced, or cleared by the CONTRACTOR.

C. Costs incurred shall be incidental to the excavating, backfilling and compacting or grading operations.

Part 2 Products

2.01 Granular Material

A. Bank run sand meeting the requirements of MDOT, Granular Material Class II.

2.02 Aggregate for Shoulders, Parking Areas, Driveways or Roads

A. Crushed Limestone, Natural Aggregate or Slag and meeting the requirements of MDOT Section 902.06

Part 3 Execution

3.01 Dewatering

A. The area within the vicinity of the new Work shall be dewatered prior to commencing any construction activities. The depth of the dewatering shall be sufficient to allow the Work area to remain in a dry condition during the various construction operations.

B. Costs incurred for furnishing, installing, maintaining and removing the dewatering equipment shall be at CONTRACTOR's expense.

C. Refer to Section 31 2319, Dewatering, for additional requirements.

3.02 General

A. The various construction operations shall be restricted to the existing right-of-way or the areas indicated on the Plans. If CONTRACTOR requires additional area, CONTRACTOR shall furnish the ENGINEER with written permission obtained from the property owner for any part of the operations he conducts outside of the right-of-way or limits indicated.

3.03 Existing Improvements

A. CONTRACTOR shall expose existing sewers and structures to which the new Work is to be connected and notify ENGINEER of same. ENGINEER will verify the vertical and horizontal locations of the existing system and shall inform CONTRACTOR as to the necessary adjustments required to align the new Work with the existing system.

3.04 Existing Utilities

A. When existing utilities are shown on the Plans, their locations are approximate only, as secured in the field investigation and/or from available public records. CONTRACTOR, prior to the start of construction, shall contact Miss Dig and the public agency or utility having jurisdiction to request the verification of all utilities within the construction area.

B. When existing utility lines, structures or utility poles are encountered during the performance of the Work, CONTRACTOR, at his expense, shall perform his operations in such a manner that the service will be uninterrupted.

C. CONTRACTOR shall expose all existing utility lines prior to any excavation operation, to determine any conflict with the proposed improvement. CONTRACTOR shall be responsible for any relocation required as a result of any conflict of existing utilities shown on the plans, with the proposed improvement.

D. Should it become necessary to move any utility structure, line or pole shown on the Plans or otherwise found necessary to be moved, CONTRACTOR shall make all arrangements with OWNER of the utility for the moving. Costs incurred for such moving shall be at CONTRACTOR's expense unless indicated otherwise. However, before disturbing a utility line, structure or pole, CONTRACTOR shall furnish ENGINEER with satisfactory evidence, in writing, that proper arrangements have been made with the owner of the utility.

3.05 Utility Poles

A. CONTRACTOR shall be responsible for any removal or relocation required as a result of any conflict of existing utility poles (including street light poles, guy poles, telephone poles, etc.) with proposed improvements.

B. CONTRACTOR shall make all arrangements for removing or relocating utility poles with the owner of the utility pole.

C. Prior to disturbing any utility pole, CONTRACTOR shall provide ENGINEER with written evidence that proper arrangements have been made with the owner of the utility pole.

D. When required by the Work, CONTRACTOR shall temporarily support poles in the vicinity of the Work at no additional cost to OWNER. Support shall be in accordance with and to the satisfaction of the utility company.

3.06 Existing Sewers, Tile, and Mains

A. Existing sanitary sewers, storm sewers, drain tile, septic tank bed tiles, water mains or building services or leads, that are encountered during the performance of the Work that require relocation or are damaged, shall be restored with new materials equal in quality and type to the materials encountered.

B. New material shall be installed as specified in the Contract Documents and per the requirements of the local agencies. Bedding and backfill material, unless otherwise specified, shall be an approved Class II granular material, compacted to 98% of its maximum unit weight.

C. Seepage bed tile and water mains shall be replaced in accordance with the requirement of the agency having jurisdiction.

D. Relocation or protection of existing sewers, tiles, tile field, water mains or building services and leads shall be at CONTRACTOR's expense, unless otherwise indicated in the Contract Documents.

3.07 Existing Structures

A. Existing surface and subsurface structures may be shown on the Plans, in locations considered most probable from information secured in the field investigation or from available public records.

B. Neither the correctness nor completeness of such information is guaranteed or implied.

C. Structures shall be protected, preserved or restored by CONTRACTOR, to the satisfaction of the structure owner, at no additional cost to the Project.

3.08 Existing Buildings

A. Existing buildings or structures may be encountered throughout the Project within limits of the presently established right-of-way or easement. Good construction methods and procedures shall be employed by CONTRACTOR, at his expense, to protect the structures.

B. When it becomes necessary for CONTRACTOR to move one of these buildings or structures in order to proceed with construction, CONTRACTOR, at his expense, shall exercise all due care in moving the building or structure to prevent undue damage. Prior to moving an existing building or structure, CONTRACTOR shall furnish ENGINEER with satisfactory evidence, in writing, that proper arrangements have been made with the owner.

C. Unless otherwise specified in the Contract Documents, the length of the move shall be maintained to a minimum which will allow for construction of the improvement.

3.09 Removal of Sewers and Culverts

A. Unless otherwise specified in the Contract Documents, CONTRACTOR, at his expense, shall remove any abandoned culvert, pipe, sewer, structure or part of a structure which is to be replaced or rendered useless by the new construction.

B. When a sewer or culvert is removed at a structure, ONTRACTOR shall install a masonry bulkhead in the structure.

C. Removal of a culvert or sewer also includes the removal and disposal of end treatments or headwalls.

3.10 Removal of Structures

A. Removal of existing structures shall consist of removing and salvaging the existing frame and cover. The ends of the existing pipe shall be plugged and braced. The complete structure shall be removed entirely and disposed of. The excavation shall be backfilled with sand and compacted to 98% of its maximum unit weight. Maximum unit weight shall be determined by ASTM D698, Method B.

B. If a structure is to be removed from a system that is to remain in service, a bypass system, approved by ENGINEER, shall be installed and maintained by the CONTRACTOR, during the rebuilding period.

3.11 Abandoning Structures

A. Structure shall be broken down to at least 30 inches (750 mm) below the subgrade.

B. Pipes connected to the structure shall be plugged with a brick, masonry or concrete bulkhead approved by ENGINEER.

C. Structure shall be backfilled with flowable fill to 1-foot (300 mm) above the pipes and the remainder of the structure backfilled with sand-cement mixture at a 10 to 1 ratio to subgrade elevation or to 1-foot (300 mm) below finished grade.

D. The remainder of the excavation shall be backfilled with a granular material, compacted to 98% of its unit weight, and shall meet with the approval of ENGINEER.

E. Maximum unit weight shall be determined by ASTM D698, Method B.

3.12 Salvaged Material

A. Salvaged materials shall become the property of CONTRACTOR unless otherwise specified in the Contract Documents, and shall be disposed of by CONTRACTOR, at his expense.

3.13 Crop Damage

A. In areas where crops are encountered along the route of the construction, a written agreement shall be arrived at by CONTRACTOR and the crop owner as to the type and nature of the crop concerned prior to any construction within the area.

B. CONTRACTOR shall be responsible for making full reimbursement to the owner of the crop damage on the basis of the following procedure:

1. Area of the crop damage shall be determined by measurements taken by ENGINEER, and this area shall include those portions of the crop which may extend into the public right-of-way.

2. Average yield of the crop shall be established by the County Office of the U.S. Agricultural Extension Service.

3. Cost of the crop shall be determined by using the prevailing price at the time of harvest as furnished by the U.S. Agricultural Extension Service.

C. CONTRACTOR shall furnish ENGINEER with satisfactory evidence that payment for crop damage was made, prior to receiving final payment on the Project.

3.14 Trees

A. Trees excepting those specified on the Plans to be removed, shall be effectively protected by CONTRACTOR during his construction operations.

1. If in the opinion of ENGINEER, the methods of protection employed by CONTRACTOR are not adequate, CONTRACTOR shall carry on his operation by tunneling, or by other approved means, which will not cause undue damage to the trees.

B. The requirements for tree tunneling are as follows:

1. Depth of Cover:

a. Tunnels shall be placed at a minimum depth of 30 inches (0.75 m), measured from the ground surface to the top of the tunnel.

2. Length of Tunnel:

a. Tunnel length in feet (meters) shall be in direct proportion to diameter of tree in inches (millimeters) for trees eight (8) inches (200 mm) or larger in diameter. One (1) foot of tunnel shall be constructed for each inch of tree diameter whenever the trench or any portion thereof approaches the tree trunk a distance in feet equal to one-half the tree diameter in inches. (Or one (1) meter of tunnel shall be constructed for every one hundred millimeters (100 mm) of tree diameter whenever any portion of the trench approaches the tree trunk a distance in meters equal to 1/200 of the tree diameter in millimeters).

b. Example: A tree 12 inches in diameter shall require a 12-foot tunnel whenever the trench or any portion thereof approaches within six (6) feet of said tree. (A tree 300 mm in diameter shall require a 3 m tunnel whenever any portion of the trench approaches within 1.5m of the tree trunk).

3. Measurements:

a. Trees under eight inches (200 mm) in diameter will require the same length of tunnel as 8-inch (200 mm) trees. Measurements of tree diameters shall be taken four (4) feet (1 m) above the ground surface.

C. Where the Plans indicate areas allowing the cutting of minor trees, care should be used to keep damage to adjacent trees to an absolute minimum. Where these areas are specifically

indicated on the Plan, they are to be cleared and all trunks and branches shall be disposed of by CONTRACTOR. Debris shall not be bulldozed on to adjacent private property.

D. Trees damaged by the construction operation shall be repaired so not to inhibit growth or replaced at the expense of CONTRACTOR. Repair or replacement shall be contingent upon agreement between the damaged tree owner and CONTRACTOR. In any event, limbs, branches and roots damaged by CONTRACTOR shall be properly pruned to the satisfaction of ENGINEER.

E. Costs incurred for protection of trees, including tunneling, repair and replacement, if necessary, shall be at CONTRACTOR's expense.

3.15 Remove and Replace Tree

A. Tree removal and replacement may be accomplished in two ways:

1. CONTRACTOR may completely remove and dispose of the existing trees, and after the new improvement has been completed, tested, accepted and rough grading has been completed, CONTRACTOR shall plant new trees, in approximately the same location as the existing trees, of size and species per the following (existing trees to be replaced with like specie):

   a. “Acer Rubrum” October Glory Red Maple, 2 ½-inch (65 mm) B&B (min)

   b. “Fraxinus Americana” Autumn Applause White Ash, 2 ½-inch (65 mm) B&B (min)

   c. “Malus Centzam” Centzam Crabapple, 2-inch (50 mm) B&B (min)

   d. “Crataegus Phaenaopyrum” Washington Hawthorn, 8-foot (2.4 m) B&B (min)

   e. “Pinus Nigra” Austrian Pine, 6-foot (1.8m) B&B (min)

   f. “Picea Pungens” Colorado Spruce, 5-foot (1.5 m) B&B (min)

   g. “Quercus Rubra” Red Oak, 2 ½-inch (65 mm) B&B (min)

   h. “Pyrus Calleryana” Redspire Pear, 2-inch (50 mm) B&B (min)

2. CONTRACTOR may remove and preserve the existing trees.

   a. The trees shall be properly cared for and maintained in a healthy condition.
   b. After the new improvement has been installed, tested, accepted and rough grading completed, the trees shall be replanted in approximately the same location. Any trees damaged, destroyed or which die, shall be replaced at no additional cost.

B. Trees, whether replanted or planted new, shall be guaranteed for a period of two years from the date of substantial completion.

3.16 Removing Pavement

A. Removal of concrete and bituminous pavement as called for on the Plans shall consist of removing and disposing of pavement and shall include base courses, surface courses, integral and separate curbs, integral and separate curb and gutters, sidewalks and end headers.

B. Pavement shall be removed to an existing joint or cut parallel to the existing pavement joints.

C. Cutting shall be accomplished by using a power-driven concrete saw approved by ENGINEER. Depth of the saw cut shall be a minimum of six (6) inches (150 mm), to insure that the removal of the old pavement will not disturb or damage the section of pavement remaining in place.

D. Residual concrete pavement shall not be less than five feet (1.5 m) measured transversely, nor less than six feet (1.8 m) longitudinally measured from a joint.

E. In removing a concrete base course, where part of the existing bituminous surface is to remain in place, the bituminous surface shall be cut the full depth by the use of a power-driven saw, approved by ENGINEER along a line parallel to and at least one foot (300 mm) from either side of the base course removal.

F. Old pavement with a concrete cap shall be considered as only one (1) pavement, whether or not there is a separation layer of earth, aggregate, or bituminous material between the old material and the concrete cap.

1. Removal of Curb for Curb Drop:

a. Where curb is to be removed for a curb drop, the operation shall be performed by saw cutting or by cold milling, approved by ENGINEER, so as to leave a neat surface with a maximum 1-inch lip, without damage to the underlying pavement.

2. Removal of Curb and Gutter:

a. Where curb and gutter are to be removed, the operation shall be performed by saw cutting. The limits of the removal shall be as called for on the Plans, or as approved by ENGINEER. However, in no case shall the width of removal be less than 18 inches (450 mm) for sections with rolled or straight curb or less than 24 inches (600 mm) for mountable curbs.

G. If during the pavement removal operation any concrete or bituminous pavement or surfacing is damaged beyond the removal limits designated, the damaged pavement or surfacing shall be removed and replaced at CONTRACTOR's expense.

H. Earth which may be removed during the pavement removal operation shall be replaced by backfilling to the proposed subgrade with a suitable material, approved by ENGINEER, at CONTRACTOR's expense.

3.17 Guardrail

A. Beam guardrail shall be relocated or shall be removed as specified on the Plans or as determined by ENGINEER. If any of the existing material is damaged or destroyed, CONTRACTOR shall replace the material at his expense.

B. Where guardrail is encountered during construction, and its removal was not called for on the Plans, it shall be replaced or restored, at CONTRACTOR's expense, to a condition comparable to that prior to construction.

C. After the guardrail removal or relocation operations are complete, all surplus material shall be removed and disposed of by CONTRACTOR, at his expense, unless otherwise called for in the Contract Documents.

D. Any holes or voids resulting from the guardrail removal operation shall be backfilled with a Class II granular material, approved by ENGINEER.

3.18 Fences

A. Fences shall be removed and replaced or shall be removed as indicated on the Plans. If any of the existing material is damaged or destroyed, CONTRACTOR shall replace the material at his expense.

B. Where fencing is encountered during construction, and its removal was not called for on the Plans, it shall be replaced or restored, at CONTRACTOR's expense, to a condition comparable to that prior to construction.

C. After the fence removal or relocation operations are complete, all surplus material shall be removed and disposed of by CONTRACTOR, at his expense, unless otherwise called for in the Contract Documents.

D. Any holes or voids resulting from the fence removal operation shall be backfilled with a suitable material, approved by ENGINEER.

E. Where fences are encountered that are being used to confine livestock or to provide security, the fence shall be immediately replaced following construction. During construction, CONTRACTOR, at his expense, shall provide, install and maintain a temporary fence, meeting the approval of ENGINEER.

3.19 Holes

A. Earth removed during any phase of the excavation or removal operations, resulting in a hole or void, shall be replaced by backfilling to the proposed subgrade with a suitable granular material. Material shall be placed by the controlled density method or other effective means having the approval of ENGINEER and shall be compacted to 95% of maximum unit weight.

B. Furnishing, placing and compacting of the backfill material shall be at CONTRACTOR's expense.

3.20 Restoration in Right-of-Way and Yard Areas

A. The right-of-way and yard areas not paved or aggregate surfaced shall be restored in accordance with the type and location specified herein unless indicated otherwise on the Plans. The disturbed areas may be shaped by "Machine Grading" or another method approved by ENGINEER to achieve the cross section, line and grade shown on the Plans. Areas where slopes are 1 on 4 or flatter shall be restored with topsoil, seed and mulch. Slopes steeper than 1 on 4 shall be restored with sod.

B. Excess material from the restoration operation shall be disposed of by CONTRACTOR at his expense.

C. Disturbed areas shall be graded to receive either topsoil and seed or topsoil and sod. Topsoil, seed, sod, fertilizer and mulch shall conform to the requirements specified on the Plans and in Section 32 9219, Seeding, or Section 32 9223, Sodding.

D. CONTRACTOR, at his expense, shall furnish, place, and compact any additional fill, meeting the approval of ENGINEER, needed to restore the disturbed areas to the cross sections called for on the Plans or as determined by ENGINEER.

3.21 Restoration of Aggregate Surfaces

A. Shoulders:

1. Shoulder shall be regarded as the area between the edge of pavement and the ditch, or the area within ten (10) feet (3 m) of the pavement, whichever is the lesser.

2. Backfilling of trenches in the shoulder area shall be carried to within five (5) inches (125 mm) of the existing surface as specified under Trench “A" or Trench "B." The remaining depth shall be backfilled with a minimum of five inches 125 mm) of compacted 22A or 23A aggregate with calcium chloride applied, at the rate of six (6) pounds per Ton of aggregate (3 kg per metric ton of aggregate).

3. CONTRACTOR, at his expense, shall furnish, place and compact all materials necessary to complete the backfilling and restoration operation within the shoulder area.

B. Driveways and Parking Areas:

1. Aggregate driveway areas shall be regarded as the area from the right-of-way line to the edge of the traveled roadway and shall include the shoulder area.

2. Backfilling of trenches crossing aggregate surfaced driveways and parking areas shall be carried to the bottom of the proposed base course as specified under Trench “B”. The remaining depth shall be backfilled with a minimum of six inches (150 mm) of compacted 22A or 23A aggregate, with calcium chloride applied at the rate of six (6) pounds per Ton of aggregate (3 kg per 1000 kg of aggregate).

3. Aggregate surfaced areas beyond the limits of the actual excavation which are disturbed, as determined by ENGINEER, by such operations as temporary storage of materials or passage of equipment, shall be resurfaced, at CONTRACTOR's expense.

   a. Upper three (3) inches (75 mm) of disturbed areas shall be removed as necessary to allow the final elevation of the resurfacing course to be at the elevation of the drive or parking area which existed prior to excavation.

   b. Disturbed area shall be resurfaced with a minimum of three (3) inches (75 mm) of compacted 22A or 23A aggregate, with calcium chloride applied at the rate of six (6) pounds per Ton of aggregate (3 kg per metric ton of aggregate).

4. CONTRACTOR, at his expense, shall furnish, place, and compact all materials necessary to complete the backfilling and restoration operations within the driveway and parking area.

C. Roads and Streets:

1. Backfilling of trenches crossing aggregate surfaced roads or streets shall be carried to within 12 inches (300 mm) of the existing surface as specified under Trench "B." The remaining depth shall be backfilled with two 6-inch (150 mm) layers of compacted 22A or 23A aggregate, with calcium chloride applied at the rate of six (6) pounds per Ton of aggregate (3 kg per metric ton of aggregate).

2. CONTRACTOR, at his expense, shall furnish, place, and compact all materials necessary to complete the backfilling and restoration operations within the roadway or street area.

3. Also, any settlement of the aggregate surface shall be restored by placing additional aggregate, up to the original grade, and shall be done at the CONTRACTOR's expense.

D. Compaction:

1. Compaction of all aggregate shall be performed by a pneumatic-tired roller or a vibratory compactor until the material forms a stable surface.

3.22 Restoration of Paved Surfaces

A. CONTRACTOR, at his expense, shall provide the materials necessary to complete the backfilling and restoration operations, which shall include furnishing, compacting, forming, placing, rolling, floating, jointing, finishing, curing and providing protection against elements.

B. Restoration of any roadways that are partially damaged shall include a minimum replacement of one (1), full width lane of roadway. The length of replacement shall be at least equal to the width.

C. Concrete:

1. Backfilling of trenches crossing concrete driveways, sidewalks, roads, streets or parking areas shall be carried to the bottom of the proposed pavement as specified under Trench "B"

2. Unless otherwise specified on the Plans or as determined by ENGINEER, the concrete removed shall be replaced with 3,500 psi (24 MPa) concrete of the thickness removed and shall include reinforcing equal to the existing, if the existing pavement was reinforced.

   a. The construction of concrete pavements shall be in accordance with Section 32 1313, Concrete Paving.

3. Restoration of sidewalks shall also include the construction of sidewalk ramps at the intersection of the curb and shall conform to the current rules and regulations of Act 8, Michigan PA 1973, as amended and to Section 32 1315, Sidewalks and Driveways, and unless otherwise indicated in the Proposal, shall be considered incidental to the Project.

D. Bituminous:

1. Backfilling of trenches crossing bituminous driveways, sidewalks, roads, streets or parking areas shall be carried to the bottom of the base course as specified under Trench "B."

2. Bituminous pavement or bituminous surface course with an aggregate base shall be replaced in accordance with Section 32 1216, Bituminous Paving.

3. Bituminous surfaced areas beyond the limits of the actual excavation which are disturbed by such operations, as temporary storage of materials or passage of equipment, shall be resurfaced with an approved bituminous mixture the same thickness as removed, but in no case less than two (2) inches 50 mm) in thickness. Replacement material shall extend to smooth-cut edges, shall be uniform in direction and shall be at an elevation which provides a uniform surface between the undisturbed abutting surfaces.

4. Restoration of any bituminous chip seal shoulders that are damaged or partially damaged, as determined by ENGINEER, shall include complete replacement full width and length (extending a minimum of 25 linear feet (7.6 m) beyond the damaged area both ways). Existing bituminous chip seal shoulders shall be brought to proper grade with compacted 22A or 23A aggregate and resurfaced with a double chip seal per Section 32 1216, Bituminous Paving.

3.23 Soil Erosion and Sedimentation Control

A. CONTRACTOR shall comply with the requirements of Section 31 2199, Temporary Erosion and Sediment Control. Prior to commencing any type of earthwork, CONTRACTOR shall obtain a Soil Erosion and Sedimentation Control permit from the local enforcing Agency.

B. CONTRACTOR, at his expense, shall obtain all approvals, secure all permits and post all bonds and deposits required to comply with the Soil Erosion and Sedimentation Control Act, Part 91 of PA 451 of 1994, as amended, and those of the enforcing agency.

C. CONTRACTOR shall provide ENGINEER with a copy of the soil erosion permit issued by the local enforcing agency for the Project, prior to commencing any type of earthwork on the Project.

3.24 Excess Excavation

A. Excess excavation shall be defined as all surplus earth material realized from the construction that is free of brush, roots, stumps, broken concrete, pipe, debris, and other extraneous material.

B. CONTRACTOR, when requested by OWNER, shall transport all excess excavation to a site(s) designated by OWNER.

1. Excess excavation shall be graded by CONTRACTOR to provide positive surface drainage of the site(s).

2. Grading shall be done such that adjacent properties are not damaged or affected. The grading shall include removal of all surface irregularities to provide a smooth surface (± 0.25 foot) (± 75 mm).

C. When the excess excavation has not been requested by e OWNER, CONTRACTOR shall remove and properly dispose of the material at no additional cost to OWNER.

D. Proper disposal of all excess excavation, including transportation, grading, and protection of adjacent properties shall be considered as a final cleanup item. No additional payment will be made for this item.

E. Brush, roots, stumps, broken concrete, pipe, debris, and other extraneous material from the construction shall become the property of CONTRACTOR, and shall be disposed of per all applicable Laws, rules or regulations. Removal and disposal of this material shall be considered as part of final cleanup. No additional payment will be made for this item.

F. OWNER approval of the final site(s) condition in writing will be required prior to final payment authorization.

End of Section

Section 31 2199
Temporary Erosion and Sediment Control

Part 1 General

1.01 Scope of Work

A. This Section includes furnishing, installing, maintaining, and removing at project completion, Soil Erosion and Sedimentation Control devices. Devices include silt fence, straw bales, turbidity barriers, temporary gravel construction entrance/exits, inlet filters, ditch sediment traps, etc.

1.02 Related Work Specified Elsewhere

A. Section 31 2198: Site Construction Performance Requirements
B. Section 31 2200: Grading
C. Section 31 2313: Subgrade Preparation
D. Section 31 2319: Dewatering
E. Section 31 2333: Trenching and Backfilling
F. Section 31 3500: Slope Protection
G. Section 32 9219: Seeding
H. Section 32 9223: Sodding
I. Section 33 1100: Water Utility Distribution Piping
J. Section 33 3000: Sanitary Utility Sewerage Piping
K. Section 33 3400: Sanitary Utility Force Mains
L. Section 33 4100: Storm Utility Drainage Piping

1.03 Reference Standards

A. ASTM American Society for Testing and Materials

1.04 Requirements of Regulatory Agencies

A. CONTRACTOR, at his expense, shall secure all permits, and post all bonds or deposits required to comply with the "Soil Erosion and Sedimentation Control," requirements, being Part 91 of PA 451 of 1994 as amended and the National Pollution Discharge Elimination System (NPDES) Rules for storm water discharges from construction activity.

B. Comply with requirements of the agency having jurisdiction. OWNER may withhold payment to CONTRACTOR equivalent to any fines resulting from non-compliance with applicable regulations.

1.05 Performance Requirements

A. Employ Best Management Practices as defined by standard EPA 832-R-92-005.

B. Put preventative measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

C. Control increased storm water runoff due to disturbance of surface cover due to construction activities for this Project.

D. Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this Project.

E. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall event that might occur in 10 years.

F. Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this Project. Prevent windblown soil from leaving the project site. Comply with fugitive dust ordinances of agencies having jurisdiction. Prevent tracking or flowing of mud and sediment onto public or private roads, sidewalks or pavements outside of the site.

G. Prevent sedimentation of waterways on or off the project site, including rivers, streams, lakes, ponds, open drainage ditches, storm sewers, and sanitary sewers. If sedimentation occurs, install or correct preventative measures immediately at no cost to OWNER. Comply with requirements of agencies having jurisdiction.

H. Maintain temporary preventative measures until permanent measures have been established. Remove temporary measures when permanent measures have been established.

I. If erosion or sedimentation occurs due to non-compliance with these requirements, remove deposited sediment or restore eroded areas at no cost to OWNER.

1.06 Submittals

A. Submit schedule of Soil Erosion and Sedimentation Control activities to agency having jurisdiction. Include events (with days and/or dates of the various activities) for review and approval prior to obtaining a permit.

Part 2 Products

2.01 Straw Bales

A. Rectangular straw bales, 14 by 18-inch (355 mm x 457 mm) minimum, bound with wire or string along long dimension. Secure with wood stakes minimum 2 by 2-inch (50 mm x 50 mm) in cross section and length as required to securely fix position of bale.

2.02 Silt Fence

A. Polypropylene geotextile fabric, resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; meeting the following requirements:

1. Average Opening Size: 30 U.S. Std. Sieve 600 µm), maximum; ASTM D4751.

2. Permittivity: 0.05 sec^{-1}, minimum; ASTM D4491.

3. Ultraviolet Resistance: Retaining at least 70% of tensile strength; ASTM D4355 after 500 hours exposure.

4. Tensile Strength: 100 lb-f (445 N) minimum, in cross-machine direction; 124 lb-f (551 N) minimum in machine direction; ASTM D4632.

5. Elongation: 15 to 30%; ASTM D4632.

6. Tear Strength: 55 lb-f (244 N) minimum; ASTM D4533

B. Posts shall be 2 by 2-inch (50 mm x 50 mm) cross section hardwood stakes, minimum 3-feet (1.0 m) long.

2.03 Turbidity Barrier

A. Geotextile fabric curtain suspended from flotation devices at the water surface and held in a vertical position by a ballast chain in the lower hem. Turbidity barrier curtain shall meet the following minimum requirements unless otherwise specified on the plans.

1. Consist of vinyl laminate on 1000 denier polyester fabric weighing 18 ounce per square yard (610 g/m^2) minimum.

2. Tensile strength of fabric shall be 220 lbs (100 kg) minimum.

3. Edges of fabric to be reinforced with minimum 5/8-inch (16 mm) diameter polypropylene rope.
4. Ballast chain minimum 5/16-inch (8 mm) galvanized steel.

5. Buoyancy blocks providing buoyancy of 18lbs/l.f (27 kg/m).

6. Length of curtain (water depth) 5-feet (1.5 m).

2.04 Dewatering Discharge Filter Bag

A. UV-stabilized, non-woven geotextile bag to filter sediment from water prior to discharging. Geotextile fabric shall meet the following minimum average roll requirements:

1. Tensile Strength: 180 lb-f (200 N) minimum; ASTM D4632
2. Elongation: 50 percent minimum; ASTM D4632
3. Puncture Strength: 105 lb-f (667 N) minimum; ASTM D4833
4. Mullen Burst: 350 psi (2413 kPa) minimum; ASTM D3786-87
5. Trapezoidal Tear: 70 lb-f (310 N) minimum; ASTM D4533
6. Flow Rate: 80 gal/min/sf. (54 l/s/m^2) Minimum; ASTM D4491
7. Permittivity: 1.4 sec $^{-1}$ minimum; ASTM D4491
8. Apparent Opening Size: 100 U.S. Std. Sieve (150 µm) maximum; ASTM D4751
9. UV-Stability: 70% retained strength; ASTM D4355 after 500 hours.

2.05 Erosion Control Blankets

A. Machine produced blanket with a consistent thickness of evenly distributed straw or coconut fiber as specified. Unless otherwise specified on the Plans, the erosion control blanket shall have the following minimum properties:

1. Double net 100% straw blanket.

2. Top and bottom photodegradable polypropylene netting, 1.64 lbs./1,000 sft. (0.8 kg/ m^2) approximate weight.

3. 100% agricultural straw 0.5 lbs/sy (.27 kg/m^2).

4. Stitch spacing: 1.5 inches (40 mm) on centers.

B. Pegs shall be 6-inch (150 mm) long, hardwood pegs.

2.06 Bonded Fiber Matrix

A. Bonded fiber matrix (BFM) shall consist of long strand, residual, softwood fibers joined together by a high-strength, non toxic adhesive. BFM shall be 100% biodegradable, and be non-toxic to fish, wildlife, and humans. Upon drying the matrix shall form a high strength, porous and erosion resistant mat that shall not inhibit the germination and growth of plants. BFM shall retain its form despite re-wetting.

B. Bonded fiber matrix shall consist of:

1. Seed and Fertilizer per Section 32 9219, Seeding.

2. Wood Fiber Mulch: Thermo-mechanically defibrated long, softwood fibers manufactured from select northern softwood wood chips.

3. Polyacrylamide Binder: Site specific, fully biodegradable, polyacrylamides (PAM's) binders, with cross-linking long organic jute fibers

C. Materials shall be mixed at the rate of 80 lbs/acre (90 kg/Ha) of PAM binder and 2500 lbs/acre (2800 kg/Ha) of wood fiber mulch.

2.07 Inlet Filter Fabric

A. Filter fabric shall be constructed of 100% continuous polyester needle-punched non-woven engineering fabric and follow the guidelines in the American Society for Testing and Materials (ASTM) D1117-99; Standard Guide for Evaluating Nonwoven Fabrics. Filter fabric shall be fabricated to provide a direct fit with the drainage structure cover. Filter fabric shall have the following minimum physical properties.

1. Tensile Strength: 80 lb-f (.355 kN) minimum; ASTM D4632
2. Elongation: 50 percent minimum; ASTM D4632
3. Puncture Strength: 45 lb-f (200 kN) minimum; ASTM D4833
4. Mullen Burst: 350 psi (2413 kPa) minimum; ASTM D3786-87
5. Trapezoidal Tear: 70 lb-f (310 N) minimum; ASTM D4533
6. Flow Rate: 80 gal/min/sf. (54 $l/s/m^2$) Minimum; ASTM D4491
7. Permittivity: 1.4 sec^{-1} minimum; ASTM D4491
8. Apparent Opening Size: 100 U.S. Std. Sieve (150 µm) maximum; ASTM D4751
9. UV-Stability: 70% retained strength; ASTM D4355 after 500 hours.

2.08 Acceptable Manufacturers

A. Acceptable manufacturers include the following:

1. Turbidity Barrier: Tough Guy Type II by Aer-flo Canvas Products, Inc.
2. Wood Fiber Mulch: EcoFibre by Canfor Corporation.
3. Polyacrylamide Binder: HydroTurboNet by Straw Net, Inc.

Part 3 Execution

3.01 Examination

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to the greatest extent possible.

B. Except in areas to be cleared, do not remove, cut, deface, injure or destroy trees or shrubs without ENGINEER's approval. Protect existing trees or shrubs that are to remain and which may be injured, bruised, defaced, or otherwise damaged by construction operations, with suitable fences or other means as approved by ENGINEER.

3.02 Preparation

A. Review the drawings and Storm Water Pollution Prevention Plan (SWPPP).

B. Revise SWPPP as necessary to address potential pollution from site identified after issuance of the SWPPP at no additional cost to Owner.

C. Conduct storm water pre-construction meeting with Site Contractor, all ground-disturbing Subcontractors, site Engineer of record or someone from their office familiar with the site and SWPPP, and state or local agency personnel in accordance with requirements of the special conditions.

D. Schedule work so that the soil surfaces are left exposed for the minimum amount of time. Place permanent soil and sedimentation control measures as soon as practical.

3.03 General

A. Do not discharge excavation ground water to the sanitary sewer, storm sewer, or to rivers, streams, etc. without authorization from the agency having jurisdiction. Construction site runoff will be prevented from entering any storm drain, river, stream, etc. directly by the use of silt fences or other suitable methods. CONTRACTOR shall provide erosion protection of surrounding soils.

B. Sedimentation control devices shall be installed prior to CONTRACTOR beginning Work. Soil erosion and sedimentation control devices shall be maintained in an effective functioning condition at all times during the course of the Work.

C. Immediately bring earthwork to final grade and protect sideslopes and backslopes from erosion. Plan and conduct earthwork to minimize duration of exposure of unprotected soils.

3.04 Installation - General

A. Install silt fences, ditch sediment traps, check dams, inlet filters, temporary gravel construction entrance/exits, turbidity barriers, erosion control blankets and other soil erosion control devices in accordance with the drawings and Storm Water Pollution Prevention Plan, or as may be dictated by site conditions in order to maintain the intent of the specifications and permits.

B. Deficiencies or changes on the drawings or SWPP shall be corrected or implemented as site conditions change. Changes during construction shall be noted in the SWPP and posted on the drawings.

C. OWNER has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations and to direct CONTRACTOR to provide immediate permanent or temporary pollution control measures

D. Remove temporary control devices after permanent measure are established. Remove and replace temporary control devices if they become ineffective at no additional cost to OWNER.

E. CONTRACTOR shall incorporate permanent erosion control features, paving, permanent slope stabilization, and vegetation into project at earliest practical time to minimize need for temporary controls.

F. CONTRACTOR shall permanently seed and mulch cut slopes as excavation proceeds to extent considered desirable and practical.

3.05 Dust Control

A. Keep dust down at all times, including during non-working periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming is not permitted.

3.06 Installation of Erosion Control Blankets

A. Erosion control blankets shall be pegged at the pattern and rate as recommended by the manufacturer, however, at a minimum, blankets shall be pegged at the rate of 1.75 pegs per square yard (2pegs/m^2) of blanket, unless otherwise indicated on the plans.

3.07 Application of Bonded Fiber Matrix

A. The slope shall be prepared and graded prior to application of bonded fiber matrix (BFM). Mixture of wood fiber mulch and polyacrylamide binder shall be blended, with the appropriate amount of seed and fertilizer per Section32 9219, Seeding, according to manufacturer's recommendations.

B. BFM shall be hydraulically applied to the soil as a viscous mixture, crating a continuous, three-dimensional blanket that adheres to the soil surface. BFM shall be mixed and applied at the rate as specified in Article 2.06 unless otherwise indicated on the Plans.

C. The resulting coverage must be at least 1/8 inch (3 mm) thick over the entire surface area. BFM shall be applied in two applications from alternate directions to eliminate shadowing, and shall be applied when no rain is expected for 12 hours.

3.08 Dewatering Discharge

A. Should it be necessary for CONTRACTOR to do any dewatering during the course of construction, CONTRACTOR shall filter all discharge through a discharge filter bag or other sediment control device that will filter all discharge water.

B. No dewatering discharge shall be allowed to flow unfiltered from the construction site.

3.09 Maintenance

A. Maintain temporary erosion and sedimentation control systems as dictated by site conditions, indicated in the construction documents, or as directed by governing authorities or OWNER to control sediment until final stabilization.

B. CONTRACTOR shall respond to maintenance or additional work ordered by OWNER or governing authorities immediately, but in no case, within not more than 48 hours if required at no additional cost to OWNER.

3.10 Inspection

A. General:

1. Daily inspections by CONTRACTOR, 14-day inspections by CONTRACTOR, and 30-day inspections by ENGINEER must be made to determine the effectiveness of the SWPPP.

2. Inspections shall be performed by a person familiar with the site, the nature of the major construction activities, and qualified to evaluate both overall system performance and individual component performance.

3. Inspector must either be someone empowered to implement BMPs in order to increase effectiveness to an acceptable level or someone with the authority to cause such things to happen.

4. Inspector must be certified as a "Storm Water Professional" through the MDEQ storm water training program. Additionally, the inspector shall be properly authorized in accordance with the applicable General Permit to conduct the certified site storm water inspections.

5. Inspector shall be a certified Operator per the MDEQ Construction Site Program.

6. CONTRACTOR is responsible to obtain and/or serve as the Certified Operator.

B. Inspection Frequency Reduction:

1. Inspection frequency may be reduced under the following conditions:

a. No active onsite construction activities.

b. Temporary cover has been provided across the entire site and no BMPs remain. Situation: waiting for grass to grow, but grass is dormant.

c. Ground is frozen and/or snow covered.

2. Weekly Storm Water Meeting:

a. A weekly storm water meeting will be held by CONTRACTOR with those involved in ground-disturbing activities to review the requirements of the permits, the SWPPP, and address any problems that have arisen in implementing the SWPPP or maintaining the BMPs.

b. CONTRACTOR shall maintain a log of weekly meetings and document the issues addressed in the meetings on site.

3. Agency Storm Water Inspections:

a. A log of inspections by federal, state, or local storm water or other environmental agencies shall be kept in CONTRACTOR's SWPPP.

b. The log form should include the date and time of visit and whether a report was issued or will be issued as a result of the inspection.

c. Any reports issued will be sent to ENGINEER within 24 hours.

3.11 Project Completion

A. Remove temporary soil erosion and sedimentation control devices as soon as permanent measures have been established.

End of Section

Section 31 2200
Grading

Part 1 General

1.01 Scope of Work

A. This Section includes site grading as indicated on the Plans, complete with removing and salvaging topsoil, rough grading, finish grading, adjusting structures, and reconstructing structures.

1.02 Related Work Specified Elsewhere

A. Section 31 2198: Site Construction Performance Requirements
B. Section 31 2199: Temporary Erosion and Sediment Control
C. Section 31 1100: Clearing and Grubbing
D. Section 31 2313: Subgrade Preparation
E. Section 31 2316: Structural Excavation and Backfill
F. Section 32 9219: Seeding
G. Section 32 9223: Sodding

1.03 Soil Erosion and Sedimentation Control

A. CONTRACTOR, at his expense, shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by ENGINEER.

B. Measures shall prevent surface runoff from carrying excavated materials into the waterways, to reduce erosion of the slopes, and to prevent silting in of waterways downstream of the Work.

C. Measures should include provisions to reduce erosion by the wind of all areas stripped of vegetation, including material stockpiles.

D. Comply with requirements of Section 31 2199, Temporary Erosion and Sediment Control.

Part 2 Products (Not Used)

Part 3 Execution

3.01 Site Grading

A. Sites shall be graded as specified on the Plans or as determined by ENGINEER. CONTRACTOR shall carry out the grading operation to prevent standing water and soil saturation detrimental to structures and improvements.

B. Provisions shall be made to preserve and protect trees and other vegetation specified on the Plans or determined by ENGINEER as not to be removed.

3.02 Removing and Salvaging Topsoil

A. Topsoil encountered along the route of the construction shall be pushed back and preserved for use in restoration following completion of the construction.

B. Topsoil must remain on each given parcel and lot throughout the Project including the existing road right-of-way adjoining the parcel or lot where it existed.

C. Removal of topsoil from the Project or movement of topsoil from one portion of the Project for use in another portion of the Project will not be allowed.

D. If there is insufficient working area, the topsoil may be removed, stockpiled and later replaced on the original lot or parcel. CONTRACTOR shall furnish ENGINEER with written permission obtained from the property owner of the property on which the topsoil is to be stockpiled, prior to commencing the stockpiling operation.

E. Topsoil shall be salvaged in an amount equivalent to the quantity required by the Plans. Topsoil salvaged in excess of that required by the Plans or as required by ENGINEER will be disposed of by CONTRACTOR at his expense.

F. Before removing topsoil, all vegetation shall be reduced to a height of approximately four inches (100 mm) and all such vegetation and all brush, stones, rocks, and any other objectionable litter or foreign material shall be removed and disposed of before the ground is broken for topsoil removal.

G. Equipment and methods of operations shall be such as to avoid the lifting of the subsoil. If soil or weather conditions are unsuitable, CONTRACTOR shall cease stripping until stripping can resumed in a suitable manner.

H. Topsoil shall be removed within the grading limits for cuts and shall be removed to a width and depth specified on the Plans or as determined by ENGINEER.

I. Topsoil shall be stockpiled within the limits of construction in areas designated on the Plans, or in areas out of the way of construction as determined by CONTRACTOR. Stockpiles shall be located and shaped so as to avoid diversion of storm water runoff, either in or out of the limits of construction, towards buildings, creation of standing water or interference of controlled irrigation. CONTRACTOR shall not place topsoil around trunks and root areas of trees to be preserved.

J. Topsoil shall be kept separate from other excavated materials that are to be used for embankment and shall be completely removed from any designated area prior to the beginning of regular excavation or placing embankment in the area.

K. Topsoil stockpiles shall be located as near the original location as possible and no payment will be made for overhaul.

L. After the completion of construction, the topsoil shall be screened through a 5/8-inch maximum size mesh screen, spread, graded, raked and prepared for seeding or sodding.

3.03 Existing Sand Onsite

A. In those instances where the construction takes place within private easements, the sand shall not be removed from each parcel or lot. Sand encountered in existing road right-of-way may be used for construction purposes throughout the Project providing it meets the requirements for the material it is intended to be used for.

B. Removal of sand from the Project will not be allowed, except for the volume displaced by the new construction.

C. If there is insufficient working area, the sand may be removed, stockpiled and replaced on the original lot or parcel. CONTRACTOR shall furnish ENGINEER with written permission obtained from the property owner of the property on which the sand is to be stockpiled, prior to commencing the stockpiling operations.

3.04 Rough Grading

A. Site shall be graded as necessary to comply with the Plans or as determined by ENGINEER. The subgrade shall be roughly established by cut or fill, approximately parallel to proposed finished grades and to elevations which allow for thickness of topsoil and installation of site or roadway improvements.

B. In fill areas all debris shall be removed from the area to be filled. Material detrimental to site improvement shall be removed from the site and acceptably disposed of as specified in Section 31 2198Site Construction Performance Requirements.

C. Original ground shall be scarified and benched or otherwise treated to provide adequate bond and to prevent slippage of fill.

D. Fill material shall be free of debris or other detrimental material and shall have a moisture content within 2 percent of optimum moisture when placed. All fill shall be compacted to a density not less than 95% of the maximum unit weight and placed in layers no less than nine inches (230 mm) and no greater than 15 inches (380 mm). The maximum unit weight shall be determined by ASTM D698, Method B.

E. If possible fills or embankments shall be constructed when the ground is frost-free and there is favorable weather. However if winter grading is necessary, all ice and snow shall be removed from the surface of the ground before the fill or embankment is placed. No frozen material will be allowed in the fill area or in the embankment being constructed. Any frozen material on a partially completed fill shall be removed before placing any more fill. Frozen material shall be stockpiled outside the grading limits until thawed. Thawed material from the stockpiled frozen material may be used in the fill and embankment areas.

3.05 Finish Grading

A. General:

1. Subgrade shall be smoothed parallel to proposed finished grades and elevations specified on the Plans. The subgrade shall be scarified to assure bond with the topsoil prior to spreading of the topsoil.

2. Topsoil shall be spread uniformly to provide a smooth, even surface at a finish grade specified on the Plans or acceptable to ENGINEER. After spreading, the topsoil shall be compacted lightly as necessary to minimize settlement. Final grades shall not vary more than one-tenth of a foot (30 mm) from the elevations indicated on the Plans.

3. Finished grading shall be done when the ground is frost-free and weather is favorable.

B. Adjust Structures:

1. Structures to be adjusted shall be as called for on the Plans or as indicated by ENGINEER.

2. Adjustment of structures shall apply where the elevation of the casting is either raised 12 inches (300 mm) or less, or lowered six (6) inches (150 mm) or less.

C. For Rehabilitation/Resurfacing Projects:

1. For structures in existing pavement, the pavement shall be sawcut a minimum of 5-foot by 5-foot unless otherwise shown on the plans.

2. For structures in concrete pavement, the structure shall be adjusted, backfilled and compacted as noted below.

3. Six inches of aggregate base course, unless otherwise noted on the plans, shall be placed below the proposed concrete pavement.

4. In areas of new concrete pavement, the concrete pavement around the structure shall be poured integral with the rest of the pavement.

5. For resurfacing projects, expansion or epoxy anchored hook bolts shall be placed 18-inches on center around the edges of the existing concrete pavement, unless otherwise shown on the plans.

6. Concrete pavement, minimum 8-inches thick, shall be replaced around the structure to the grade of the adjoining concrete pavement.

7. For structures in bituminous pavement, the pavement shall not be sawcut until after the bituminous base or leveling courses have been completed.

8. Structure shall be adjusted, backfilled and compacted as noted below.

9. Six inches of aggregate base course, unless otherwise noted on the plans, shall be placed below the proposed pavement.

10. A minimum of 8-inches of concrete pavement, unless otherwise noted on the plans, shall be placed to the elevation of the adjoining bituminous base or leveling courses.

11. The bituminous wearing course around the structure shall be placed integral with the wearing course on the remainder of the project.

D. For Bituminous Reconstruction or New Construction Projects:

1. Frame and cover on all new and existing structures shall be removed and the structure plated prior to placing the bituminous base or leveling courses.

2. Bituminous base and leveling courses shall be placed over the plated structures.

3. Prior to placing the bituminous wearing course, the bituminous base and leveling courses shall be sawcut a minimum of 5-foot by 5-foot unless otherwise shown on the plans.

4. Structure shall be adjusted, backfilled and compacted as noted below.

5. Six inches of aggregate base course, unless otherwise noted on the plans, shall be placed below the proposed pavement.

6. A minimum of 8-inches of concrete pavement, unless otherwise noted on the plans, shall be placed to the elevation of the adjoining bituminous base course.

7. Bituminous wearing course around the structure shall be placed integral with the wearing course on the remainder of the project.

8. Sawcutting, removal and replacement of concrete and bituminous pavement, and aggregate base course, shall be incidental to the adjusting the structure unless otherwise noted in the Contract Documents.

9. Existing frame and cover shall be carefully removed and stored, and shall be reinstalled on the same structure, unless a new frame and cover are called for on the Plans.

10. Brick courses or concrete adjustment rings shall be removed or installed as necessary to adjust the structure's frame and cover to the proper elevation.

11. Brick or concrete adjustment rings shall be set in mortar or installed as shown on the Plans and as determined by ENGINEER.

12. Outside surface of the new brick or block structures shall receive a masonry plaster coat, a minimum of 1/2 inch (10 mm) thick.

13. Structure shall be properly backfilled with Class II granular material, compacted in place, and meeting the approval of ENGINEER.

14. Flow in the entire system shall be maintained, at CONTRACTOR's expense, while performing any part of the Work. Also, the structure shall be cleaned and all unsuitable material shall be disposed of at CONTRACTOR's expense.

3.06 Reconstruct Structures

A. General:

1. Structures to be reconstructed shall be as called for on the Plans or as determined by ENGINEER.

2. Reconstruction of structures shall apply where the elevation of the casting must be raised in excess of 12 inches (300 mm), lowered in excess of six (6) inches (150 mm), or to rebuild portions of the existing structure which are deteriorated.

B. For Rehabilitation/Resurfacing Projects:

1. For structures in existing pavement, the pavement shall be sawcut a minimum of 5-foot by 5-foot unless otherwise shown on the plans.

2. For structures in concrete pavement, the structure shall be reconstructed, backfilled and compacted as noted below.

3. Six inches of aggregate base course, unless otherwise noted on the plans, shall be placed below the proposed concrete pavement.

4. In areas of new concrete pavement, the concrete pavement around the structure shall be poured integral with the rest of the pavement.

5. For resurfacing projects, expansion or epoxy anchored hook bolts shall be placed 18-inches on center around the edges of the existing concrete pavement, unless otherwise shown on the plans.

6. Concrete pavement, minimum 8-inches thick, shall be replaced around the structure to the grade of the adjoining concrete pavement.

7. For structures in bituminous pavement, the pavement shall not be sawcut until after the bituminous base or leveling courses have been completed.

8. Structure shall be reconstructed, backfilled and compacted as noted below.

9. Six inches of aggregate base course, unless otherwise noted on the plans, shall be placed below the proposed pavement.

10. A minimum of 8-inches of concrete pavement, unless otherwise noted on the plans, shall be placed to the elevation of the adjoining bituminous base or leveling courses.

11. Bituminous wearing course around the structure shall be placed integral with the wearing course on the remainder of the project.

C. For Bituminous Reconstruction or New Construction Projects:

1. Frame and cover on new and existing structures shall be removed and the structure plated prior to placing the bituminous base or leveling courses.

2. Bituminous base and leveling courses shall be placed over the plated structures.

3. Prior to placing the bituminous wearing course, the bituminous base and leveling courses shall be sawcut a minimum of 5-foot by 5-foot unless otherwise shown on the plans.

4. Structure shall be reconstructed, backfilled and compacted as noted below. Six inches of aggregate base course, unless otherwise noted on the plans, shall be placed below the proposed pavement.

5. A minimum of 8-inches of concrete pavement, unless otherwise noted on the plans, shall be placed to the elevation of the adjoining bituminous base course.

6. Bituminous wearing course around the structure shall be placed integral with the wearing course on the remainder of the project.

7. Sawcutting, removal and replacement of concrete and bituminous pavement, and aggregate base course, shall be incidental to the reconstructing the structure unless otherwise noted in the Contract Documents.

8. Existing frame and cover shall be carefully removed and stored, and shall be reinstalled on the same structure unless a new frame and cover are called for on the Plans.

9. Existing corbel entrance sections or precast concrete chimney type entrance shall be removed along with any additional brick courses or precast concrete sections necessary to achieve the amount of reconstruction called for on the Plans or as determined by ENGINEER.

10. The necessary brick work and precast concrete sections shall be installed to meet the design grade.

11. Manhole steps shall be furnished and shall be installed, as necessary, so that maximum spacing is 24-inches (600 mm).

12. Brick or concrete adjustment rings shall be set in mortar or installed as shown on the Plans and as determined by ENGINEER.

13. Outside surface of the new brick or block structures shall receive a masonry plaster coat, a minimum of 1/2 (10 mm) inch thick.

14. Structure shall be properly backfilled with Class II granular material, compacted in place, and meeting the approval of ENGINEER.

15. Flow in the entire system shall be maintained, at CONTRACTOR's expense, while performing any part of the Work.

16. Structure shall be cleaned and all unsuitable material shall be disposed of at CONTRACTOR's expense.

End of Section

Section 31 2313
Subgrade Preparation

Part 1 General

1.01 Scope of Work

A. This Section includes preparing subgrade for pavement construction complete with excavation, embankments, proof rolling, subgrade undercut and backfill, subgrade stabilization fabric, subbase, right-of-way ditching, right-of-way restoration, field quality control, and appurtenances.

1.02 Related Work Specified Elsewhere

A. Section 31 2198: Site Construction Performance Requirements
B. Section 31 2199: Temporary Erosion and Sediment Control
C. Section 31 1100: Clearing and Grubbing
D. Section 31 3500: Slope Protection
E. Section 31 2319: Dewatering
F. Section 32 3100: Fences and Gates
G. Section 32 9219: Seeding
H. Section 32 9223: Sodding
I. Section 32 9300: Plants

1.03 Reference Standards

A. Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

1. ASTM - ASTM International

2. AASHTO - American Association of State Highways and Transportation Officials

3. MDOT - Michigan Department of Transportation, 2003 Standard Specifications for Construction

1.04 Allowable Tolerances

A. Finish subgrade surface shall be shaped to conform to plan grade and cross section within a tolerance of one-inch (25 mm) in ten (10) feet (3.0 m).

1.05 Submittals

A. Test Reports:

1. Testing lab shall provide ENGINEER with two (2) certified copies of the sieve analysis of the backfill material.

2. Testing of the material and the certification of the test results shall be performed by a testing laboratory approved by ENGINEER.

3. Testing lab shall provide ENGINEER with two (2) certified copies of the compaction and moisture tests of the backfill and subgrade materials.
4. Testing of the materials and the certification of the test results shall be performed by a testing laboratory approved by the ENGINEER.

B. Samples:

1. Submit sample of the proposed subgrade stabilization fabric measuring not less than 1 yd^2 (1 m^2) in area, and the manufacturer's certification that the proposed fabric meets or exceeds all requirements listed in Article 2.03 of this Section.

2. Submissions shall be made not later than 10 working days prior to any installation.

1.06 Product Delivery Storage and Handling

A. Geotextile fabric shall be furnished and stored in a wrap that will protect the geotextile from ultraviolet radiation and abrasion.

B. Geotextile shall be covered with the aggregate base as per plan within two (2) weeks of its placement.

1.07 Soil Erosion and Sedimentation Control

A. CONTRACTOR shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by ENGINEER.

B. Measures shall prevent surface runoff from carrying excavated materials into the drain, to reduce erosion of the slopes, and to prevent silting in of drain downstream of the Work.

C. Measures should include provisions to reduce erosions by the wind of all areas stripped of vegetation, including material stockpiles.

D. Comply with requirements of Section 31 2199, Temporary Erosion and Sediment Control.

Part 2 Products

2.01 Granular Materials

A. Granular material gradation shall conform to the grading requirements for granular material Class II as specified in MDOT, Section 902.08.

2.02 Aggregate Materials

A. Aggregate materials, used for undercut backfill shall be crushed limestone, natural aggregate, blast furnace slag, or crushed concrete, meeting the requirements of 21AA, 21A or 22A as specified in MDOT Section 902.06.

B. Crushed concrete shall be free of all steel and other deleterious materials.

2.03 Subgrade Stabilization Fabric

A. Subgrade stabilization fabric shall be composed of synthetic fibers formed into a woven fabric. The fibers shall be composed of 85% propylene or ester polymers. The geotextile shall conform to the following requirements listed below:

Property	Test Procedure	Test Result
Grab Tensile	ASTM D4632	270 lbs. (min)
Elongation	ASTM D4632	15% (min)
Trapezoidal Tear	ASTM D4533	100 lbs. (min)
Puncture Strength	ASTM D4833	100 lbs. (min)
Apparent Opening Size	ASTM D4751	40 – 70 U.S. Sieve
Permittivity	ASTM D4491	0.05 per sec (min)
Mullen Burst	ASTM D3786	400 psi (min)

Part 3 Execution

3.01 Removing Structures

A. Structures and sewers to be removed shall be called for on the Plans or as determined by ENGINEER. Removal or abandonment of structures shall be in accordance with Section 01 8900, Site Construction Performance Requirements.

3.02 Holes

A. Earth removed during any phase of the excavation or removal operations, resulting in a hole or void, shall be replaced by backfilling to the proposed subgrade with a suitable granular material approved by ENGINEER.

B. Material shall be compacted to 95% of its maximum unit weight.

C. Furnishing, placing and compacting of the backfill material shall be at CONTRACTOR's expense.

3.03 Salvaging and Stockpiling Topsoil

A. Topsoil, within the grading limits for cuts, and where the fill is less than five (5) feet (1.5 m) in height to the top of proposed road, shall be removed to a depth and width specified on the Plans.

B. Topsoil from peat and muck areas shall not be removed.

C. Topsoil salvaged in excess of that required by the Plans will be disposed of by the CONTRACTOR at his expense.

D. Removing and salvaging topsoil shall be in accordance with Section 31 2200, Grading.

3.04 Preparing Roadway Subgrade

A. Muck, peat and other unsuitable material within the roadway shall be removed, displaced or otherwise treated, as shown on the Plans or as directed by ENGINEER.

B. Deposits of frost heave material within lines two (2) feet (0.6 m) outside the proposed roadbed shall be removed to a depth of three (3) feet (0.9 m) below the surface of the earth grade, unless otherwise shown on the Plans or as determined by ENGINEER.

C. Ice and snow shall be removed from the surface of the ground before the embankment is placed.

D. Muck, peat, frost heave material and other unsuitable material shall be disposed of outside the highway limits or shall be spread uniformly in low places beyond the roadway limits when so approved by ENGINEER.

E. Old road surfacing or gravel, crushed stone, or other nonrigid type surfacing, occurring within the area of the roadbed and underlying proposed embankment less than 1-foot in depth, and which is not to be salvaged and incorporated in the new Work, shall be plowed or scarified full depth, spread and compacted to form a uniform foundation, before any new embankment is placed.

F. Old pavement and other rigid structures, occurring within the area of the roadbed and underlying the proposed embankment less than 1-foot in depth and which are not to be incorporated into the new Work, shall be broken up and removed.

3.05 Subgrade

A. Area to be paved shall be excavated and smoothed to the line, grade and cross section as indicated on the Plans.

B. Subgrade between the lines two (2) feet (0.6 m) on either side of the proposed edge of pavement or curb shall be compacted to 95% of the maximum unit weight for a depth of seven (7) inches (175 mm), by rolling with a roller weighing not less than ten (10) tons (9000 kg).

C. Subgrade shall be completed ahead of placing forms or paving a distance equal to the distance of one day's average paving operation. Prior to the paving operation, the subgrade shall be shaped and compacted to the Plan cross section by approved mechanical means.

3.06 Pavement Excavation

A. Pavement excavation shall consist of all Work required to construct the earth grade and its appurtenances true to the lines, grades, and cross sections called for on the Plans and in accordance with these Specifications.

B. Excavation shall consist of the following items, any of which or all of which may be included or incidental to it; removing trees, stumps, hedges, roots, culverts, sewers, miscellaneous structures, roadway excavation, removing of all asphalt or concrete pavements, curbs, curb and gutters, sidewalks, end headers, removing aggregate surfaces, salvaging and stockpiling topsoil, subgrade undercut, excavation for structures, trimming and finishing earth grade, fine grading, right-of-way ditching and restoration, and the disposal of all unsuitable material.

C. Large stones, trees, stumps, brush, shrubs, logs, matted roots, other vegetation and debris occurring between lines three (3) feet (0.9 m) outside the grading limits or as otherwise shown on the Plans shall be completely removed and properly disposed of as specified in Section 31 1100, Clearing and Grubbing.

D. Earth and other existing materials shall be excavated for the full depth and width of the cross section as shown on the Plans. Material shall be excavated sufficiently for setting of forms or slip-form equipment. Excavation shall be limited to 3,000 linear feet (900 m) of right-of-way unless additional lengths are requested in writing and approved by ENGINEER.

E. Excess excavated material shall be removed from the project by CONTRACTOR along approved routes to disposal sites approved by OWNER. Disposal of excess excavation and maintenance of the dump sites shall be considered incidental to the price paid for excavation and shall be as specified in Section 01 8900, Site Construction Performance Requirements.

3.07 Borrow Excavation

A. Materials which are secured from locations outside of the project limits for the purpose of completing embankments and other items, will be considered as borrow excavation.

B. Borrow pits and the materials to be removed therefrom shall be subject to the inspection of ENGINEER and shall be secured by CONTRACTOR, unless otherwise provided.

C. Borrow excavation will be measured by volume in cubic yards compacted in place, based on the neat lines called for on the Plans or as authorized by ENGINEER. To facilitate the accurate measurement of borrow quantities, unless otherwise specified in the Contract Documents, CONTRACTOR shall perform all the regular excavation and grading with existing materials for any designated area and ENGINEER will cross section these areas prior to CONTRACTOR furnishing and placing the required borrow material. ENGINEER will then resection the completed area and compute the volume of borrow material in its compacted-in-place state. Any borrow material placed beyond the neat lines called for on the Plans or which is not authorized by ENGINEER in writing will not be measured and computed as borrow excavations. Measurement of borrow material by truck count will not be acceptable.

D. Public and private roads used by CONTRACTOR between the source of borrow and the Project shall be maintained by ONTRACTOR, at his expense, including repairs of any damage caused by his operations. Also included is the application of a dust palliative when necessary, as determined by ENGINEER.

3.08 Embankments

A. Embankments shall be constructed with sound earth. Materials shall be deposited and compacted by either the Twelve Inch Layer Method, or the Controlled Density Method. The Controlled Density Method will be required unless the twelve inch layer method or some other method is specifically called for on the Plans.

B. Topsoil shall be stripped from the entire fill area. Depth of the topsoil to be removed shall be as shown on the Plans or as determined by ENGINEER. After the topsoil is removed, the entire area upon which the embankment is to be constructed shall be compacted to not less than 90% of the maximum unit weight, to a depth of nine (9) inches (225 mm).

C. Where stones are prevalent, the material shall be carefully placed so that all large stones will be well distributed and the crevices completely filled with smaller stones, earth, sand or gravel so as to form a solid embankment. Rock or fragmental material of such size as would prohibit it from being placed in layers of the specified depth shall not be placed in the embankment. In no case shall stones over three (3) inches (75 mm) in diameter be placed within 12 inches (300 mm) of the surface of the earth grade within the areas between lines two (2) feet (0.6 m) outside of the edges of proposed roadbed.

D. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material.

E. Construction requirements for the two (2) methods of placing and compacting embankments are as follows:

1. Twelve-Inch Layer Method:

a. Material shall be deposited and spread in layers not more than 12 inches (300 mm) in depth, loose measure, parallel to the finished grade and extending to the full width of the embankment. Material shall be deposited by operating the conveying equipment over the layer being placed, insofar as feasible.

b. Each layer shall be compacted to not less than 95% of the maximum unit weight as determined at the existing moisture content. Operation of compacting shall be continued until each layer is compacted to the required density for its full width.

2. Controlled Density Method:

a. Material for the embankment shall be deposited and spread in layers not more than nine (9) inches (225 mm) in depth, loose measure, and extending to the full width of the embankment, except that granular material may be spread and compacted in layers not more than 15 inches (375 mm) in thickness if the specified density is obtained.

b. Material for embankments of five (5) feet (1.5 m) or less and the bottom four (4) feet (1.2 m) of embankments of more than four (4) feet (1.2 m) above the surface of the ground upon which the embankment is to be constructed shall have not more than the optimum moisture content at the time of compaction.

c. Material for that part of the embankment more than five (5) feet (1.5 m) above the surface of the ground upon which the embankment is to be constructed shall have a moisture content of not greater than three (3) percent above optimum at the time of compaction, except that the moisture content of the top three feet (0.9 m) of the embankment shall not exceed optimum. If granular material is used to construct the embankment, it shall be at a moisture content below saturation.

F. If the material contains an excess of moisture, it shall be dried to the required moisture content before being compacted.

G. Each layer of material containing the required amount of moisture shall be compacted to not less than 95% of its maximum unit weight, unless otherwise specified, before the succeeding layer is started.

H. When the original ground upon which the embankment is being placed, or any section of compacted embankment, or the soil in cut sections becomes rutted or distorted by CONTRACTOR's equipment, the method of operation shall be changed to eliminate this condition. CONTRACTOR shall reshape and recompact any areas so rutted or distorted at his own expense. This shall be done before any succeeding layers are placed.

3.09 Rough Grading

A. CONTRACTOR shall rough grade as close as possible to finished subgrade leaving a minimum to be removed in fine grading.

B. Excavated material removed during grading and stored along the line of Work between curb and sidewalk on improved lawns shall not be left longer than 48 hours. Lawns or otherwise improved areas shall be left in a neat and clean state within the specified 48 hours.

C. During the excavation operation, including the placing of the subbase, the Work area shall be kept free of water. A dewatering system shall be provided and maintained by CONTRACTOR at his expense. The dewatering system shall remain in operation until the paving is completed.

3.10 Proof Rolling

A. After removal of topsoil or other overburden and after construction of embankments, proof roll the existing subgrade with six passes of a minimum 15 ton pneumatic-tired roller. Operate the roller in a systematic manner to assure the number of passes over all areas, and at speeds between 2.5 and 3.5 miles per hour. When proof rolling under structures, one-half of the passes made with the roller shall be in a direction perpendicular to the other passes.

B. Proof rolling shall be done in the presence of ENGINEER. Rutting or pumping shall indicate unsatisfactory material and that material shall be undercut as determined by ENGINEER, and replaced with the appropriate fill material.

C. Perform proof rolling only when weather conditions permit. Do not proof roll wet or saturated subgrades. Materials degraded by proof rolling a wet or saturated subgrade shall be replaced by CONTRACTOR as determined by ENGINEER at no cost to OWNER. Notify ENGINEER 3 days prior to proof rolling.

3.11 Subgrade Undercut Excavation

A. Unsuitable subgrade excavation shall be the operation of:

1. removing unsuitable soils as determined by ENGINEER, below the level of the ground after topsoil has been stripped in fill areas where the embankment is to be five (5) feet (1.5 m) or less in height to plan grade, or

2. the removal of unsuitable soils below the subgrade elevation, as determined by ENGINEER in cut areas after the subgrade has been established.

B. In fill areas, after topsoil has been stripped in accordance with Article 3.03 of this Section, ENGINEER will inspect the embankment area to certify the adequacy of the native soils and to determine the extent of any additional excavation of unsuitable soils prior to placing the first lift of the embankment.

C. In cut areas after the subgrade elevation has been established by the mass grading operation, ENGINEER will inspect the subgrade to determine the extent of any additional excavation of unsuitable soils.

D. The areas excavated of unsuitable material, unless otherwise specified in the Contract Documents, shall be backfilled with nonfrost heaving material similar to the adjacent soil. However, in areas as determined by ENGINEER where free water due to seepage is present, the excavation shall be backfilled with Granular Material, Class II, and drainage shall be provided. Backfill shall be compacted to not less than 95% of the maximum unit weight, unless otherwise specified.

3.12 Subgrade Stabilization Fabric

A. Place Subgrade Stabilization Fabric on prepared subgrade or subbase in the manner and at the location as called for on the plans. Fabric shall be laid smooth and free of tension stress, wrinkles or creases.

B. Fabric strips shall be placed to provide a minimum overlap of 24 inches (600 mm) for each joint.

C. Fabric shall be placed so that the upper strip will overlap the next lower strip.

D. Should the geotextile be damaged during construction, the torn or punctured section shall be repaired by placing a piece of fabric that is sufficiently large to cover the damaged area plus two feet (0.6 m) to adjacent undamaged geotextile in all directions.

3.13 Trimming and Finishing Earth Grade

A. After the earth grade has been constructed to the required grade, all stones and rocks more than three (3) inches (75 mm) in diameter, appearing on the surface of the subgrade shall be removed.

B. Earth grade and the subgrade shall be trimmed to the grade called for on the Plans. Subgrade, where a subbase is required, shall be trimmed to the established grade within ± 0.1 foot (30 mm). Where a subbase is not required, the subgrade shall be trimmed to the established grade within ± 3/4 inch (20 mm).

C. Earth grade outside the subgrade shall be trimmed, all irregularities made smooth and the entire site or roadway completed to the required lines, grades, and cross sections. Backslopes and fill slopes shall be finished as either Class A or Class B slopes. Class A slopes shall be required unless otherwise specified in the Contract Documents.

1. Class A Slopes:

   a. Class A slopes shall be finished to the average slopes shown on the Plans with no variations at any point more than 0.1 foot (30 mm) above or below the established grade measured at right angles to the slopes.

2. Class B Slopes:

   a. Class B backslopes shall be finished to the average slopes shown on the Plans with no variations at any point more than 0.5 foot (150 mm) above or below the established grade measured at right angles to the slope. The degree of finish of the slopes shall be that obtainable from machine operations. The smoothness of surface finish ordinarily associated with template or string line and hand operations will not be required, but abrupt variations will not be permitted. Debris except sod, leaf mold and rotted forest litter shall be removed and loose clods of earth extending beyond the 0.5 foot (150 mm) tolerance shall be broken or removed.

   b. Class B fill slopes shall be finished to within 0.2 foot (60 mm) of the established grade and cross section from the outside shoulder line for a distance of three (3) linear feet (0.9 m) down the slope. The remainder of the completed fill slope shall conform to the requirements for Class B backslopes.

Where waste earth or other surplus material is deposited on fill slopes, the slopes may be flattened or otherwise altered as directed by ENGINEER, to produce a uniform cross section which blends with the topography and presents a pleasing appearance.

D. Where trees or other restrictions do not interfere, the tops of backslopes, bottoms of fill slopes and all other angles in the lines of the cross section shall be rounded to form vertical curves as shown on the Plans or as determined by ENGINEER. Transitions in length of vertical curves shall be gradual and shall present a uniform and attractive appearance. When ditches are constructed in peat, vertical curves may be omitted.

3.14 Subbase

A. Granular material for subbase shall be evenly spread and compacted as specified in MDOT Section 301.

B. Thickness of each layer placed shall be determined by the required density obtained but shall not exceed 15 inches (375 mm) in depth, loose measure.

C. Subbase shall be constructed to the alignment, grade and cross section shown on the Plans. Should the subgrade at any time prior to or during the placing of the subbase become soft or unstable so that rutting occurs in the subgrade, or if the subgrade material is forced up into the subbase material, the operation shall immediately cease and the mixed material shall be removed and disposed of. Subgrade shall be corrected and new subbase material placed and compacted. This Work shall be considered incidental to the construction of the Project.

3.15 Scarify, Re-Grade and Compact Existing Subgrade

A. Existing subgrade (base) shall be scarified to a depth of 9-inches to the limits as shown on the plans. Subgrade shall then be re-shaped to the cross section as shown on the plans and compacted. Subgrade shall then be compacted to 95% of the maximum unit weight by rolling with a roller weighing not less than ten (10) tons (9000 kg).

3.16 Roadway Ditching

A. Ditching shall be constructed at the locations called for on the Plans or as determined by ENGINEER. Ditch may be shaped by "Machine Grading" or another method approved by ENGINEER to achieve the cross section, line and grade shown on the Plans.

B. Excess material from the ditch construction shall be disposed of by CONTRACTOR at his expense.

C. Ditch section shall be graded to receive either topsoil and seed or topsoil and sod. Topsoil, seed, sod, fertilizer and mulch shall conform to the requirements specified on the Plans and in Section 32 9219, Seeding or Section 32 9223, Sodding.

D. CONTRACTOR, at his expense, shall furnish, place and compact any additional material needed to construct the ditch at the location and cross sections called for on the Plans.

3.17 Right-of-Way Restoration

A. Right-of-way shall be restored in accordance with the type and location specified on the Plans. Right-of-way may be shaped by "Machine Grading" or another method approved by ENGINEER to achieve the cross section, line and grade shown on the Plans.

B. Excess material from the right-of-way restoration operation shall be disposed of by the CONTRACTOR at his expense, as specified in Section 01 8900, Site Construction Performance Requirements.

C. Right-of-way shall be graded to receive either topsoil and seed or topsoil and sod. Topsoil, seed, sod, fertilizer and mulch shall conform to the requirements specified on the Plans and in Section 32 9219, Seeding or Section 32 9223, Sodding.

D. CONTRACTOR, at his expense, shall furnish, place, and compact any additional fill, meeting the approval of ENGINEER, needed to construct the right-of-way to the cross sections called for on the Plans.

3.18 Machine Grading

A. Work of machine grading shall consist of light grading of such character that, in general, the excavation from ditches and roadbed will be utilized in shaping shoulders and adjacent shallow fills and the work can be performed by a blade grader or similar equipment. Machine grading shall apply on the sections shown on Plans or specified in the Proposal.

B. Work shall include all necessary scarifying, plowing, discing, moving and shaping the earth to develop the cross section shown on Plans.

C. Ditches shall be in reasonably close conformity with the line and grade as shown on the Plans or as directed and must drain runoff waters to outlets shown on the Plans or designated by ENGINEER.

D. Roadbed shall be finished to grade with a blade grader or equivalent equipment.

E. Intersections, approaches, entrances, and driveways shall be graded as shown or as directed, except that loading and hauling of earth will not be required as part of this Work.

3.19 Maintenance Aggregate

A. CONTRACTOR shall furnish and install 21A, 21AA or 22A maintenance aggregate to maintain pedestrian and traffic access. Aggregate shall be placed and compacted to maintain access in areas as determined by ENGINEER. Maintenance aggregate will be incidental to the Project unless otherwise specified in the Contract Documents.

3.20 Testing

A. During the course of the Work, ENGINEER may require testing for compaction, sieve analysis and moisture content of the backfill and subgrade materials.

B. Taking of samples and the testing required shall be performed by a testing laboratory suitable to OWNER and approved by ENGINEER. Cost for testing and sampling shall be at the expense of OWNER.

C. ENGINEER shall determine the location and number of samples to be made. The testing laboratory shall furnish the ENGINEER with two (2) certified copies of the results of all tests.

D. Testing procedures shall conform to current MDOT Standards for Construction.

E. Maximum unit weight when used as a measure of compaction or density of soils shall be understood to mean the maximum unit weight per cubic foot (or cubic meter) as determined by ASTM D1557, Method D, modified to include all the material passing the 1-inch (25 mm) sieve.

3.21 Defective Work

A. Any portion of the backfill, subbase or subgrade which is deficient in the specified density shall be corrected by methods meeting the approval of ENGINEER.

B. Extra testing or sampling required by ENGINEER, because of deficiencies, shall be at CONTRACTOR's expense.

End of Section

Section 31 2316
Structural Excavation and Backfill

Part 1 General

1.01 Scope of Work

A. This Section includes excavation for structures, removal and disposal of excavated materials, backfilling, backfill materials and compaction.

1.02 Related Work Specified Elsewhere

A. Section 31 2198: Site Construction Performance Requirements
B. Section 31 2199: Temporary Erosion and Sediment Control
C. Section 31 1100: Clearing and Grubbing
D. Section 31 2200: Grading
E. Section 31 2319: Dewatering
F. Section 32 9219: Seeding
G. Section 32 9223: Sodding
H. Section 33 1100: Water Utility Distribution Piping
I. Section 33 3000: Sanitary Utility Sewerage Piping
J. Section 33 3400: Sanitary Utility Force Mains
K. Section 33 4100: Storm Utility Drainage Piping

1.03 Reference Standards

A. Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

1. ASTM - ASTM International

2. AASHTO - American Association of State Highways and Transportation Officials

3. MDOT - Michigan Department of Transportation, 2003 Standard Specifications for Construction

1.04 Submittals

A. Testing laboratory shall provide ENGINEER with two (2) certified copies of the test results of the compaction of the backfill. The testing for compaction and the certification of the test results shall be performed by a testing laboratory approved by ENGINEER.

1.05 Soil Erosion and Sedimentation Control

A. CONTRACTOR shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by ENGINEER.

B. Measures shall prevent surface runoff from carrying excavated materials into the waterways, to reduce erosion of the slopes, and to prevent silting in of waterways downstream of the Work.

C. Measures should include provisions to reduce erosion by the wind of areas stripped of vegetation, including material stockpiles.

D. Comply with requirements of Section 31 2199, Temporary Erosion and Sediment Control.

Part 2 Products

2.01 Granular Materials

A. Granular material gradation shall conform to the grading requirements for granular material, Classes I and II, as specified in MDOT, Section 902.08. Granular material shall be natural bank run sand.

2.02 Coarse Aggregate

A. Coarse aggregate gradation shall conform to coarse aggregate, 6A, as specified in MDOT, Section 902.03.

Part 3 Execution

3.01 Dewatering

A. Area within the vicinity of the new Work shall be dewatered in accordance with Section 31 2319, Dewatering prior to the excavation operation.

B. Depth of the dewatering shall be sufficient to allow the excavation to remain in a dry condition during the construction of the structure, including the excavating, backfilling and compacting operations.

3.02 Sheeting, Shoring, and Bracing

A. CONTRACTOR shall furnish, place and maintain at all times such sheeting, shoring, and bracing of the excavated area as may be required for safety of the workmen and for protection of the new Work or adjacent structures, including pavement, curbs, sidewalks, pipelines and conduits next to, or crossing the excavated area, and for the protection and safety of pedestrian and vehicular traffic.

B. CONTRACTOR shall be responsible for the complete design of all sheeting, shoring and bracing Work.

C. The design shall be appropriate for the soil conditions, shall be of such strength, quality, dimension and spacing as to prevent caving or loss of ground or squeezing within the neat lines of the excavation, and shall effectively restrain movement of the adjacent soil.

D. Prior to installing the sheeting, shoring or bracing, CONTRACTOR shall submit Plans for this Work to ENGINEER for informational purposes only.

E. Sheeting, shoring, and bracing, and excavation shall conform to current federal or state regulations for safety.

F. Where indicated on the Plans and where necessary in the Work, install and leave sheeting, shoring, and bracing in place. No extra compensation shall be paid to CONTRACTOR for sheeting, shoring or bracing left in place unless otherwise indicated in the Proposal.

G. Supports for pipes, conduits, etc., crossing the excavated area shall conform to the requirements of the owners of such facilities and if necessary, shall be left in place.

H. Furnishing, placing, maintaining and removing of sheeting, shoring, and bracing materials shall be at CONTRACTOR's expense unless otherwise indicated in the Proposal.

I. CONTRACTOR shall not remove the sheeting, shoring or bracing until the structure has obtained sufficient strength to support the external loads.

J. Sheeting, shoring and bracing material shall not come in contact with the structure, but shall be installed so that no concentrated loads or horizontal thrusts are transmitted to the structure.

3.03 Cofferdams

A. A cofferdam shall consist of the maintenance, installation and removal of a substantially watertight enclosure or a well-point system or similar system, which will permit construction of the substructure, above seal or subfooting, in the dry and without damage to the Work. Alternate methods, where used in lieu of cofferdams, will be permitted by authorization only. Such authorization will be considered only after receipt of a permit from all federal, local or State agencies with jurisdiction for the alternate method.

B. Stream diversion and earth dikes, where used in lieu of cofferdams or a well-point system will be permitted by authorization only. Such authorization will be considered only after receipt of a permit from all federal, local or State agencies with jurisdiction for such construction.

C. Interior dimensions of cofferdams shall be such as to give sufficient clearance for the construction of forms and the inspection of their exteriors, and to permit dewatering outside of the forms.

D. Cofferdams, caissons or cribs which are tilted or moved laterally during the process of sinking shall be righted or enlarged so as to provide the necessary clearance.

E. Cofferdams shall not be braced to substructure forms. They shall be constructed so as to protect the Work in place against damage from high water and to prevent injury to the foundation by erosion. No timber bracing shall extend into or remain in the finished concrete.

F. Cofferdams shall be removed in such a manner as not to disturb or mar the finished concrete. When called for on the Plans or where necessary in the Work, cofferdam sheeting shall be left in place.

G. Furnishing, construction, maintenance and removal of the cofferdams including pumping shall be at CONTRACTOR's expense. If CONTRACTOR elects to use a well-point system or similar system, he shall be responsible for any claims for damages resulting therefrom.

3.04 Excavation

A. Excavation shall include the site clearing and grubbing, the excavating and disposing of materials encountered, the supporting and protecting of structures and/or utilities encountered above and below the ground surface, and the removal of water from the construction site.

B. Excavation shall also include the removal of existing structures, as shown on the Plans or as determined by ENGINEER.

C. Rock excavation, if applicable, shall be performed as a part of the excavation in accordance with specifications contained elsewhere.

D. CONTRACTOR shall keep the limits of his excavation operations within a reasonable close conformity with the location and grade, of each structure.

E. Excavated materials shall be temporarily stored in a manner that will not cause damage to trees, shrubs, fences, improvements, utilities, private property or traffic. The excavated materials shall not be placed at such locations that will endanger the banks of the excavation by imposing loads thereon.

F. Excavation shall be of sufficient size to allow for the construction of the new Work, the placing and compacting of the backfill and for the dewatering operation.

G. When concrete is to bear on or against an excavated surface other than rock, special care shall be taken not to disturb the surface. The final removal of the foundation material to grade shall not be made until just prior to the placing of the concrete.

H. Concrete shall not be placed until the depth of the excavation has been checked and the suitability of foundation material has been reviewed by ENGINEER.

I. Excavated material, determined by ENGINEER as suitable for backfill may be used. All excess materials shall be disposed by CONTRACTOR, at his expense, as specified in Section 31 2198, Site Construction Performance Requirements.

J. Elevations for the bottom of footings shall be subject to such changes as are necessary to insure a satisfactory foundation. Any changes required shall be reviewed by ENGINEER prior to making the change.

K. Surface of all rock or other hard material upon which concrete is to be placed shall be free of all loose fragments, cleaned and cut to a firm surface. The surface shall be level, stepped or serrated, as shown on the Plans.

L. Unsound material underlying proposed structures shall be removed and replaced with granular material approved by ENGINEER, in layers not exceeding six (6) inches (150 mm) in depth. Each layer shall be compacted to 95% of maximum unit weight unless indicated otherwise on the Plans, or within these specifications.

3.05 Backfill

A. Backfill material shall be placed only after the new Work and backfill material have been inspected by ENGINEER.

B. Backfill shall not be placed against any portion of the new Work until the required curing, surface finishing and waterproofing of such portions have been completed. Backfill which will place an unequalized horizontal loading on the new Work shall not be placed until the concrete has attained at least 70% of its design strength. To equalize horizontal loadings, the required backfill around the new Work shall be placed on opposite sides at the same time.

C. Granular material shall be used for backfilling within three (3) feet (1 m) of manholes, chambers, valve wells, valve boxes, other pipeline structures, footings, piers, abutments, columns, walls, foundations, etc., unless otherwise indicated in the Contract Documents.

D. Spaces excavated and not occupied by the new Work or by the specified backfill material, shall be backfilled with suitable material from the excavation.

E. After the backfill has been placed and compacted to the flow line elevation of any weep holes indicated on the Plans, the back end of each weep hole shall be covered with not less than two (2) cubic feet (0.5 m^3) of coarse aggregate.

F. Large stones, boulders, broken rocks, concrete, and masonry shall not be used in the backfill.

G. Backfill shall be carried up to the surface of the adjacent ground or to the elevation of the proposed earth grade, and its top surface shall be neatly graded. Fills around all new Work shall be trimmed to the lines shown on the Plans or as directed by ENGINEER.

3.06 Compacting Backfill

A. Backfill behind and around the new Work shall be placed in layers, not more than nine (9) inches in depth, and shall be compacted to not less than 95% of the maximum unit weight.

B. Areas where the density does not affect the construction, as determined by ENGINEER, shall be compacted to not less than 90% of maximum unit weight.

C. Backfill material shall be placed as specified in MDOT, Section 206.03.B, except for the following modifications. Backfill material shall have a moisture content not greater than three (3) percent above optimum, at the time of compaction. If the material contains an excess of moisture, it shall be dried to the required moisture content before being installed.

D. Each layer of material containing the required amount of moisture shall be compacted to not less than 95% of the maximum unit weight, unless otherwise specified on the Plans or authorized by ENGINEER, before the succeeding layer is started.

E. Compaction of the backfill will not be paid for separately, but shall be considered incidental to the Work of backfilling and shall include all the Work of manipulating the soil to obtain the specified densities. No additional compensation will be allowed for any delay required to obtain the specified moisture content or the specified density.

3.07 Cleanup

A. Immediately following the placing and compacting of the backfill, the excess material shall be removed and disposed of by CONTRACTOR, at his expense, as specified in Section 31 2199, Site Construction Performance Requirements.

B. Construction area shall be graded and left in a neat, workmanlike condition.

C. At a seasonally correct time, the disturbed area shall be raked, having topsoil placed thereon, fertilized and restored per the requirements of Section 32 9219, Seeding, or Section 32 9223, Sodding.

3.08 Testing

A. During the course of the Work, ENGINEER may require testing for compaction or density of the backfill. The taking of samples and the testing required shall be performed by a testing laboratory approved by ENGINEER. The cost for testing and sampling shall be at the expense of OWNER.

B. Testing laboratory shall furnish ENGINEER with two (2) certified copies of the results of all tests. Testing procedures shall conform to current MDOT, Standards for Construction.

C. Maximum unit weight, when used as a measure of compaction or density of soils, shall be understood to mean the maximum unit weight per cubic foot or per cubic meter as determined by ASTM D1557, Method A, for granular materials conforming to MDOT, Class I, and Method D, for granular materials and all other soils.

3.09 Defective Work

A. Any portion of the backfill which is deficient in the specified density shall be corrected by the methods meeting the approval of ENGINEER. Extra testing or sampling required because of apparent deficiencies shall be at CONTRACTOR's expense.

End of Section

Section 31 2319
Dewatering

Part 1 General

1.01 Scope of Work

A. This Section includes all dewatering work complete with design of dewatering systems, construction and operation of dewatering systems, abandonment of dewatering systems, protection of personnel and structures, environmental protection and restoration.

1.02 Related Work Specified Elsewhere

A. Section 31 2198: Site Construction Performance Requirements
B. Section 31 2199: Temporary Erosion and Sediment Control
C. Section 31 2316: Structural Excavation and Backfill
D. Section 31 2333: Trenching and Backfilling
E. Section 1: Cast-In-Place Concrete

1.03 Design of Dewatering Construction

A. Geotechnical Investigations made in relation to this Project are provided as reference documents. Interpretation of data and reports, performing additional investigations, and obtaining additional data for construction purposes is the responsibility of CONTRACTOR.

B. CONTRACTOR shall be responsible for the complete design of structures and methods proposed for dewatering the project site, including the implementation of materials, tools and equipment proposed for use in the Work. Temporary wiring associated with the dewatering shall comply with applicable portions of the National Electrical Code.

C. Provide monitoring wells as necessary to determine the groundwater levels along the alignment and shaft locations.

1.04 Soil Erosion and Sedimentation Control

A. Dewatering systems design and construction shall conform to the provisions of Part 91 Soil Erosion and Sedimentation Control, of Act 451 “Natural Resources and Environmental Protection Act” PA 451 of 1994; and Section 01 5713, Temporary Erosion and Sediment Control. Where applicable, CONTRACTOR shall obtain and pay for permits and inspections for dewatering construction in accordance with the provisions of PA 451, State of Michigan, 1994, and local government agencies having jurisdiction. No additional claim for compensation shall be allowed because of CONTRACTOR's failure to obtain or pay for such permits and inspections.

B. CONTRACTOR, at his expense, shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by ENGINEER. The measures shall prevent surface runoff from carrying excavated materials into the waterways, to reduce erosion of the slopes, and to prevent silting in of waterways downstream of the Work. Also, the measures should include provisions to reduce erosion by the wind of areas stripped of vegetation, including material stockpiles.

1.05 Federal, State, and Local Regulations

A. Dewatering operations shall conform to the requirements of all federal, state, and local agencies having jurisdiction.

B. Dewatering water discharged to streams, drains or sewers may require permits from federal, state or local agencies having jurisdiction. CONTRACTOR shall comply with all water quality requirements prior to discharging dewatering water. CONTRACTOR shall be responsible for testing and treatment required to meet water quality requirements prior to discharge. No discharges to sanitary sewers will be allowed without prior approval of local agencies with jurisdiction for the sanitary sewers.

1.06 Protection

A. Take steps necessary, during the Work of this Section, to protect surrounding property and adjacent buildings, private water supplies, roads, drains, sewers, structures and appurtenances. Adequate measures shall be taken to protect such property and construction from the effects of the dewatering operations.

1.07 Submittals

A. Submit detailed plans indicating proposed type and location of dewatering wells, type and location of collection/conveyance piping, and point of disposal of pumped water. Do not begin any dewatering work until submittals and supporting data have been reviewed by ENGINEER.

B. Dewatering system shall be designed by a professional with a minimum of seven years documented experience in the installation and design of dewatering systems. Submittal shall be signed and sealed by a registered professional engineer, stating that the proposed dewatering method is adequate to perform the required tasks.

Part 2 Products (Not Used)

Part 3 Execution

3.01 General

A. Provide electrical power from local utility. Provide stand-by power and any other required auxiliary dewatering equipment to assure continuous dewatering capability. Dewatering, where required, shall be continuous. Dewatering will not be stopped during work stoppage without approval of ENGINEER. Coordinate construction operations to minimize duration and extent of dewatering required.

B. Dewatering wells are to use properly designed filters to prevent the migration of soil fines into the well.

3.02 Monitoring and Control

A. During dewatering operations, monitor ground water level with piezometers to ensure the design or specified groundwater elevation is maintained. Install monitoring wells with screens below the excavation level as required. Install wells at minimum 200-foot intervals located between dewatering wells. Provide access to monitoring wells by ENGINEER.

B. Modify dewatering operation if geotechnical instrumentation or survey measurements indicate movement of structures, sheeting or embankments, or inability to lower groundwater as specified.

C. Inspect wells and lines on a daily basis to ensure integrity and watertightness. Keep fittings and connections watertight to ensure release of sulfide to atmosphere from groundwater does not occur.

3.03 Existing Drainage Conditions

A. Prior to beginning any work, verify in the field the location, type and capacity of existing drainage facilities and conditions which will affect the Work of this Section. No allowances shall be made for conditions found during the progress of the dewatering operations because of CONTRACTOR'S failure to verify such conditions.

3.04 Existing Structures and Utilities

A. CONTRACTOR shall make field verification of all existing structures and utilities at the site of the Work which are scheduled to remain and which may be affected by the Work of this Section. CONTRACTOR shall be responsible for any damage to existing structures and/or utilities caused because of his Work and shall repair such damage at his expense to the satisfaction of ENGINEER or utility owner.

3.05 Drainage of Excavations

A. CONTRACTOR shall maintain all finished excavation Work free of water during the preparation of the subgrade and until the completion of the Work. No ground or surface water shall be discharged into existing sanitary sewer. No unit of Work shall be constructed under water except as otherwise determined by ENGINEER. Provide and maintain adequate dewatering equipment to remove and dispose of surface or groundwater entering excavations, trenches or other parts of the Work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the construction is complete.

B. Excavations which extend down to or below the static groundwater elevation shall be dewatered by lowering and maintaining the groundwater level beneath such excavations a distance of not less than 12 inches (300 mm) below the bottom of the excavation. Drainage system methods shall not cause damage to wells or adjacent property. Outlet drainage piping and conduit shall be kept clean and free from sediment. CONTRACTOR shall be held responsible for the condition of all existing pipes, conduits and structures which he may use for drainage.

3.06 Dewatering Sumps and Pump Wells

A. Sumps and pump wells used as a part of the dewatering system shall be strongly sheathed and braced to protect the construction while in use. Tops of well casings must be covered to prevent animals and debris from entering and shall be 2 to 3 feet (0.6 to 0.9 m) above ground. Sumps and wells, when abandoned, shall be backfilled and compacted to the satisfaction of ENGINEER.

3.07 Drilling

A. Methods used in drilling wells associated with dewatering systems shall be the responsibility of CONTRACTOR and shall be acceptable to ENGINEER.

B. Drilling methods shall insure proper placement of well materials and shall not involve displacement of earth formations.

C. Drilling shall be done with first class equipment of proper type and in good condition, acceptable to ENGINEER.

3.08 Pumping

A. Equipment for pumping and pumping methods associated with dewatering systems shall be the responsibility of the CONTRACTOR and shall be acceptable to ENGINEER. CONTRACTOR shall construct or furnish adequate discharge piping to conduct and dispose of the water so as to prevent damage to existing structures or property. Pumping equipment shall be first class, acceptable to ENGINEER, of proper type and size for the Work and in good condition. Provide anchors and supports for pumping equipment.

3.09 Filling and Grading

A. Upon completion of dewatering Work for the Project, abandon and/or fill holes, trenches, ditches and other earth excavations created by the Work of this Section and not scheduled to remain. Do filling, backfilling and grading to restore excavations and earth banks to the lines and levels indicated on the Plans and as determined by ENGINEER. Earth fills shall be compacted to a density equal to that of the surrounding undisturbed earth.

End of Section

Section 31 2333
Trenching and Backfilling

Part 1 General

1.01 Scope of Work

A. This Section includes open trench construction for utility installation, complete with trenching, sheeting, bracing, bedding, bedding materials, backfilling, backfill materials, and compaction.

1.02 Related Work Specified Elsewhere

A. Section 31 2198: Site Construction Performance Requirements
B. Section 31 2199: Temporary Erosion and Sediment Control
C. Section 31 1100: Clearing and Grubbing
D. Section 31 2200: Grading
E. Section 31 2316: Structural Excavation and Backfill
F. Section 33 1100: Water Utility Distribution Piping
G. Section 33 3000: Sanitary Utility Sewerage Piping
H. Section 33 3400: Sanitary Utility Force Mains
I. Section 33 4100: Storm Utility Drainage Piping

1.03 Reference Standards

A. Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

1. ASTM - ASTM International

2. AASHTO - American Association of State Highways and Transportation Officials

3. MDOT - Michigan Department of Transportation, 2003 Standard Specifications for Construction

1.04 Test Reports

A. Testing laboratory shall provide ENGINEER with two (2) certified copies of the test results of the compaction of the backfill.

B. Testing for compaction and the certification of the test results shall be performed by a testing laboratory approved by ENGINEER.

1.05 Mix Design

A. Submit mix designs for any concrete or flowable fill mixtures to be used on the Project. Include certified test results for seven day and 28 day strengths, together with any technical information for admixtures.

1.06 Soil Erosion and Sedimentation Control

A. CONTRACTOR, at his expense, shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by ENGINEER.

B. Measures shall prevent surface runoff from carrying excavated materials into the drain, to reduce erosion of the slopes, and to prevent silting in of drain downstream of the Work.

C. Measures should include provisions to reduce erosions by the wind of all areas stripped of vegetation, including material stockpiles.

D. Comply with requirements of Section 31 2199, Temporary Erosion and Sediment Control.

Part 2 Products

2.01 Class II Granular Materials

A. Class II granular material gradation shall conform to the grading requirements for granular material Class II, as specified in MDOT, Section 902.08 except as follows. Class II granular material shall be natural bank run sand with a maximum size of 1½-inches (38 mm).

2.02 Crushed Stone Bedding

A. Crushed, angular, natural stone material, meeting the requirements of MDOT 21AA. Crushed concrete and slag are not allowed.

2.03 Concrete

A. Concrete shall conform to MDOT, Section 701, use grade S3; 3,000 psi (21 MPa) strength; Type I-A cement; 5.5 sacks cement per cubic yard (307 kg/m^3); 6A coarse aggregate; 2NS fine aggregate; 6.5% ± 1.5% air content; 3-inch (75 mm) maximum slump; no admixtures without ENGINEER's review.

2.04 Flowable Fill for Backfilling

A. Materials:

1. Fly Ash: Fly Ash shall have a maximum loss on ignition of 12% and meet the other requirements of ASTM C618 (Class F).

2. Water: Water shall meet the requirements of ASTM C94.

3. Cement: ASTM C150 or C595, Type I or IA.

B. Mixture (Strength 100 - 120 psi, (690 - 825 kPa)):

1. Fly Ash: 2000 lbs/c.y. (1190 kg/m^3) min
2. Cement: 70 lbs/c.y. (40 kg/m^3) min
3. Water: Sufficient water to produce desired flowability, 700 lbs/c.y. (415kg/m^3) ±

C. Temperature of the flowable fill mix as manufactured and delivered shall be at least 50 degrees Fahrenheit (10 degrees Celsius). Flowable fill can be mixed by pugmill, central concrete mixer, ready mix truck, turbine mixer, or other acceptable equipment or method.

Part 3 Execution

3.01 Dewatering

A. Area within the vicinity of the trenching operation shall be dewatered in accordance with Section 31 2319, Dewatering prior to the trenching operation.

B. Depth of the dewatering shall be sufficient to allow the trench excavating operation including backfilling and compacting to proceed in a dry condition.

3.02 Trench Excavation

A. Open cut trench excavation shall include the site clearing and grubbing, the excavating of all materials encountered, the supporting and protecting of all structures and/or utilities encountered above and below the ground surface, and the removal of water from the construction site.

B. Trenching operation shall commence at the downstream or outlet end of the new Work and proceed upstream, unless otherwise specified on the Plans or directed by ENGINEER.

C. Trench shall be excavated in reasonably close conformity with the lines and grades specified on the Plans or as established by ENGINEER.

D. Excavated materials shall be temporarily stored along the trench in a manner that will not cause damage to trees, shrubs, fences, improvements, utilities, private property, public property or traffic. The excavated materials shall not be placed at such locations that will endanger the trench banks by imposing loads thereon.

E. Trench shall be of sufficient width to provide adequate working space to permit the installation of the pipe and the compaction of the bedding material under and around the pipe. However, for rigid pipe, the width of the trench from below the pipe bedding to 12 inches (300 mm) above the top of the pipe shall not exceed the following dimensions:

Diameter of Pipe	**Width of Trench**
6-inch thru 12-inch pipe (150 thru 300 mm)	30 inches wide (750 mm)
15-inch thru 36-inch pipe (375 thru 900 mm)	outside diameter plus 16 inches (400 mm)
42-inch thru 60-inch pipe (1050 thru 1500mm)	outside diameter plus 20 inches (500mm)
over 60-inch pipe (1500mm)	outside diameter plus 24 inches (600 mm)

F. Support the additional load of the backfill when the maximum trench width as specified for rigid pipe is exceeded, CONTRACTOR shall install, at his expense, concrete encasement which shall completely surround the pipe and shall have a minimum thickness at any point of 1/4 of the outside diameter of the pipe or four (4) inches (100mm), whichever is greater, or at his expense, install another type bedding, approved by ENGINEER. Concrete encasement shall consist of 3,000 psi (21 MPa) strength concrete.

G. For flexible pipe, the minimum width shall be not less than the greater of either the pipe outside diameter plus 16 in. (400 mm) or the pipe outside diameter times 1.25, plus 12 in. (300 mm). Maximum trench width for flexible pipe shall not exceed the minimum width by more than 6-inches.

H. To support the additional load of the backfill when the maximum trench width as specified for flexible or semi-rigid pipe is exceeded, CONTRACTOR shall install, at his expense, crushed stone pipe bedding to the full width between undisturbed trench walls or at least 2.5 pipe diameters on each side of the pipe.

I. When through, CONTRACTOR's construction procedure or because of unsuitable existing ground conditions, it becomes impossible to maintain alignment and grade properly, CONTRACTOR, at his expense, shall excavate below the normal trench bottom grade and shall fill the void with a large size aggregate or 3,000 psi (21 MPa) concrete as approved by ENGINEER to ensure that the pipe when laid in the proper bedding will maintain correct alignment and proper grade.

J. Trench excavations, including those for shafts and structures, shall be adequately braced and/or sheeted where necessary to prevent caving or squeezing of the soil.

3.03 Sheeting, Shoring, and Bracing

A. CONTRACTOR shall furnish, place and maintain at all times such sheeting, shoring, and bracing of the trench and/or shaft as may be required for safety of the workmen and for protection of the new Work or adjacent structures, including pavement, curbs, sidewalks, pipe lines, conduits next to or crossing the trench, and the protection and safety of pedestrian and vehicular traffic.

B. CONTRACTOR shall be responsible for the complete design of all sheeting, shoring and bracing Work. The design shall be appropriate for the soil conditions, shall be of such strength, quality, dimension and spacing as to prevent caving or loss of ground or squeezing within the neat lines of the excavation, and shall effectively restrain movement of the adjacent soil. Prior to installing the sheeting, shoring or bracing, CONTRACTOR shall submit Plans for this Work to ENGINEER for informational purposes only.

C. Sheeting, shoring, bracing, and excavation shall conform to the current federal or state regulations for safety.

D. Where indicated on the Plans and where necessary in the Work, install and leave sheeting, shoring, and bracing in place. No extra compensation shall be paid to CONTRACTOR for sheeting, shoring or bracing left in place.

E. Supports for pipes, conduits, etc., crossing the trench shall conform to the requirements of the owners of such facilities, and if necessary, shall be left in place.

F. The furnishing, placing, bracing, maintaining, and removing of sheeting, shoring, and trenching materials shall be at CONTRACTOR's expense. CONTRACTOR shall not remove the trench sheeting, shoring and bracing unless the pipe has been properly bedded, and the trench backfilled to sufficiently support the external loads. Also the sheeting, shoring, and bracing material shall not come in contact with the pipe, but shall be installed so that no concentrated loads or horizontal thrusts are transmitted to the pipe.

3.04 Pipe Bedding

A. Install and compact in six inch layers. Particular care shall be taken to assure filling and tamping all spaces under, around, and above the top of the pipe. Work in and around pipe by hand to provide uniform support.

B. Rigid Pipe Bedding:

1. Rigid pipe bedding shall conform to ASTM C12, except as noted.

a. Class R-A:

(1) Pipe shall be bedded in crushed stone bedding material placed on the trench bottom. Bedding shall have a minimum thickness beneath the pipe of four (4) inches (100 mm) or 1/4 of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the pipe to the horizontal centerline. The top half of the pipe shall be covered with a monolithic plain concrete arch having a thickness of at least four (4) inches (100 mm) or 1/4 of the inside diameter of the pipe, whichever is greater, at the pipe crown and a

minimum width equal to the outside diameter of the pipe plus eight (8) inches (200 mm) or 1-1/4 of the diameter of the pipe, whichever is greater.

b. Class R-B:

(1) Pipe shall be bedded in crushed stone bedding material placed on the trench bottom. Bedding shall have a minimum thickness beneath the pipe of four inches (100 mm) or 1/8 of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the pipe to the horizontal centerline. Backfill from pipe horizontal centerline to a level not less than 12 inches (300 mm) above the top of the pipe shall be Class II granular material. This material shall be placed in 6-inch (150 mm) layers with each layer thoroughly compacted by mechanical means with the finished compacted material a minimum of 12 inches (300 mm) above the top of pipe.

c. Class R-C:

(1) Pipe shall be bedded in Class II granular material, placed on the trench bottom. Bedding shall have a minimum thickness beneath the pipe of four (4) inches (100 mm) or 1/8 of the outside diameter of the pipe, whichever is greater, and the bedding shall extend to a level not less than 12 inches (300 mm) above the top of the pipe. This material shall be placed in 6-inch (150 mm) layers with each layer thoroughly compacted by mechanical means with the finished compacted material a minimum of 12 inches (300 mm) above the top of pipe.

C. Flexible Pipe Bedding:

1. Flexible pipe bedding shall conform to ASTM D2321, except as noted. Continuous and uniform bedding shall be provided in the trench for all buried pipe.

a. Class F-I:

(1) Pipe shall be bedded in crushed stone bedding material placed on the trench bottom. Bedding shall have a minimum thickness beneath the pipe of four (4) inches (100 mm), and shall extend up the sides of the pipe until the top of pipe is covered by a minimum thickness of 12 inches (300 mm).

(2) Where allowable trench widths are exceeded, Class F-I bedding shall be used to the full width between undisturbed trench walls. Concrete cradle bedding shall not be used.

b. Class F-II:

(1) Pipe shall be bedded in crushed stone bedding material placed on the trench bottom. Bedding shall have a minimum thickness beneath the pipe of four (4) inches (100 mm), or 1/8 of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the pipe to the horizontal centerline. Backfill from pipe horizontal centerline to a level not less than 12 inches (300 mm) above the top of the pipe shall be Class II granular material. This

material shall be placed in 6-inch (150 mm) layers with each layer thoroughly compacted by mechanical means with the finished compacted material a minimum of 12 inches (300 mm) above the top of pipe.

(2) Where allowable trench widths are exceeded, Class F-I bedding shall be used to the full width between undisturbed trench walls. Concrete cradle bedding shall not be used.

c. Class F-III:

(1) Pipe shall be bedded in Class II granular material, placed on the trench bottom. Bedding shall have a minimum thickness beneath the pipe of four (4) inches (100 mm) or 1/8 of the outside diameter of the pipe, whichever is greater, and the bedding shall extend to a level not less than 12 inches (300 mm) above the top of the pipe. This material shall be placed in 6-inch (150 mm) layers with each layer thoroughly compacted by mechanical means with the finished compacted material a minimum of 12 inches (300 mm) above the top of the pipe.

(2) Where allowable trench widths are exceeded, Class F-I bedding shall be used to the full width between undisturbed trench walls. Concrete cradle bedding shall not be used.

3.05 Backfilling Trenches

A. Backfill material shall be placed on sections of bedded pipes only after such pipe bedding and backfill materials have been approved by ENGINEER.

B. Trench backfilling shall follow the pipe laying as closely as possible. However, at no time shall the pipe laying in any trench precede backfilling of that trench by more than 100 feet (30 m), unless otherwise directed by ENGINEER.

C. Backfilling shall not be done in freezing weather except by permission of ENGINEER. Frozen materials shall not be used in trench backfilling.

D. Following trench backfill specifications are for use in that portion of the trench beyond the scope of the pipe bedding requirements which normally stops at a point 12 inches (300 mm) above the top of pipe.

1. Backfill material to be placed above pipe bedding shall be free of cinders, ashes, refuse, boulders, roots, stumps, trees, timbers, brush, debris, or other extraneous materials which in the opinion of ENGINEER, are unsuitable.

2. Rocks or stones having a dimension larger than six (6) inches (150 mm) shall not be placed within three (3) feet (1 m) of the top of the pipe.

3. Large stones may be placed in the remainder of the trench backfill only if well separated and arranged so that no interference with backfill settlement will result.

E. The type and method of backfilling is dependent on its location and function and shall conform to the following requirements:

1. Trench "B":

a. Trenches under road surfaces, pavement, curb, driveway, sidewalk and where the trench edge is within three (3) feet (1m) of the pavement and as noted on the plans shall be backfilled with natural bank run sand meeting the requirements of Class II granular material, unless otherwise indicated on the Plans. The material shall be placed in uniform layers that can be adequately compacted and tested from the surface of that layer and shall be compacted to 95% of the materials maximum unit weight. Trenches under pavement to be constructed in the near future, as noted or shown on the Plans, shall be backfilled with natural bank run sand, meeting the requirements of Class II granular material, unless otherwise indicated on the Plans, as herein provided.

b. Where a pipe is installed under an existing or proposed utility, the backfill between the two shall be natural bank run sand meeting the requirements of Class II granular material, unless otherwise indicated on the Plans, constructed as herein specified.

2. Trench "A":

a. All other trenches shall be backfilled with suitable excavated material placed in uniform layers that can be adequately compacted and tested from the surface of that layer. Each layer shall be thoroughly compacted by approved mechanical methods to a density equivalent to the undisturbed adjacent soil or 90% of its maximum unit weight which ever is less.

F. Unless otherwise specified on the Plans or as directed by ENGINEER, the trench backfill shall be carried to the adjacent existing ground.

G. Where any backfill or bedding as shown on the plans or specified is to be flowable fill, care shall be used to avoid displacing any pipes or structures due to fluid pressure. Pipes in backfill areas may need to be secured to avoid the bouyancy effect.

3.06 Compacting Trench "B" Backfill

A. Trench "B" backfill shall be compacted to 95% of the maximum unit weight, unless otherwise specified on the Plans or authorized by ENGINEER.

B. Compaction of the backfill will not be paid for separately, but shall be considered incidental to the Work of backfilling and shall include all the Work of manipulating the soil, to obtain the specified densities. No additional compensation will be allowed for any delay required to obtain the specified moisture content or the specified density.

3.07 Cleanup

A. Immediately following the placing and compacting of the backfill, the excess material shall be removed and disposed of by CONTRACTOR, at his expense, as specified in Section 01 8900, Site Construction Performance Requirements. The construction area shall be leveled and left in a neat workmanlike condition.

B. At a seasonally correct time, approved by ENGINEER, the disturbed area shall be raked, having topsoil placed thereon, fertilized and seeded per the requirements of Section 32 9219, Seeding, or sodded in accordance with Section 32 9223, Sodding.

3.08 Field Testing

A. During the course of the Work, ENGINEER may require testing for compaction or density of the backfill. Taking of samples and the testing required shall be performed by a testing laboratory suitable to OWNER and approved by ENGINEER. The cost for testing and sampling shall be at the expense of OWNER.

B. Maximum unit weight, when used as a measure of compaction or density of soils, shall be understood to mean the maximum unit weight per cubic foot or per cubic meter as determined by ASTM D1557, Method D.

3.09 Defective Work

A. Any portion of the trench backfill which is deficient in the specified density shall be corrected by methods meeting the approval of ENGINEER.

B. Any extra testing or sampling required because of deficiencies shall be at CONTRACTOR's expense.

End of Section

Section 31 3500
Slope Protection

Part 1 General

1.01 Scope of Work

A. This Section includes plain riprap, grouted riprap, concrete slope paving, precast concrete block slope paving, interlocking precast concrete slope paving, grouted flagstone, preseeded erosion control blankets, wire mesh gabions, precast concrete grid slope pavers, geotextile filter fabric, and concrete bag slope protection.

1.02 Related Work Specified Elsewhere

A. Section 31 2198: Site Construction Performance Requirements
B. Section 31 2199: Temporary Erosion and Sediment Control
C. Section 32 9219: Seeding
D. Section 32 9223: Sodding

1.03 Reference Standards

A. Unless otherwise specified, the Work of this Section shall conform to the applicable portions of the following Standard Specifications:

1. ASTM - ASTM International

2. Fed. Spec. - Federal Specifications

3. MDOT - Michigan Department of Transportation, 2003 Standard Specifications for Construction

4. USDC (NBS) - U.S. Department of Commerce, National Bureau of Standards

1.04 Submittals

A. Manufacturer's Literature:

1. Submit manufacturer's literature describing materials and fabrication methods for the type of geotextile filter fabric, wire mesh gabions, precast concrete slope pavers, preseeded erosion control blankets and precast concrete grid pavers proposed for use in the Work.

B. Samples:

1. Submit samples of the types of geotextile filter fabric proposed for use in the Work to ENGINEER.

C. Shop Drawings:

1. Submit Shop Drawings of wire mesh gabions showing wire sizes, finishes, fabrication, assembly and erection methods for all wire mesh gabions proposed for use in the Work.

1.05 Product Delivery, Storage, and Handling

A. Geotextile Filter Fabric:

1. During delivery, storage, and handling, geotextile filter fabric shall be wrapped in a heavy duty covering which will protect the fabric from direct sunlight, ultraviolet rays, temperatures greater than 140 degrees Fahrenheit, mud, dirt, dust, debris and the elements.

B. Wire Mesh Gabions:

1. When polyvinyl chloride coated wire mesh gabions are used in the Work, these units shall be protected against freezing temperatures during delivery, storage, handling, also damage to PVC coating.

1.06 Job Conditions

A. Temperature:

1. Comply with the requirements for placing slope protection materials due to outside ambient air temperatures as specified under Article 3.06 of this Section.

B. Subbase Conditions:

1. Comply with the requirements for placing slope protection materials on prepared subbase because of frost and freezing conditions as specified under Article 3.06 of this Section.

C. Slope Protection Materials:

1. Comply with the requirements for protection of slope protection materials during curing periods as described under Article 3.06 of this Section.

1.07 Soil Erosion and Sedimentation Control

A. CONTRACTOR, at his expense, shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by ENGINEER.

B. Measures shall prevent surface runoff from carrying excavated materials into the drain, to reduce erosion of the slopes, and to prevent silting in of drain downstream of the Work.

C. Measures should include provisions to reduce erosions by the wind of all areas stripped of vegetation, including material stockpiles.

D. Comply with requirements of Section 31 2199, Temporary Erosion and Sediment Control.

Part 2 Products

2.01 Form Work

A. Forms for concrete shall be metal or wood. Forms shall be straight, free from warps and of sufficient strength to resist springing during depositing of the concrete against the form surfaces.

2.02 Concrete

A. In accordance with MDOT Section 701, use Grade S2; 3,500 psi strength (24 MPa); Type IA cement; 6.0 sacks cement per cubic yard (335 kg/m^3); 6A coarse aggregate; 2NS fine aggregate; 6.5% + 1.5% air content; 3-inch (75 mm) maximum slump; no admixtures without ENGINEER's approval.

2.03 Concrete Reinforcement

A. In accordance with MDOT Section 905, use ASTM A615, Grade 60 for bars and ASTM A185 for welded wire fabric.

2.04 Membrane Curing Compound

A. Curing compound shall be a transparent membrane type material conforming to ASTM C309, Type I, Class B vehicle. Test for moisture retention, reflectance and drying time, when performed, shall be based on a curing compound application rate of one (1) gallon per 200 square feet (4 l per 20 m^2) of surface.

2.05 Stone Riprap

A. Stone for riprap shall be sound, tough, durable rock, free from structural defects. Stone shall be a minimum of 8-inches (200 mm) thick measured perpendicular to the slope, with a least surface dimension of 12 to 16-inches (300 to 400 mm) measured parallel to the slope. Maximum to minimum ratio shall not exceed 3:1.

2.06 Concrete Riprap

A. Sound pieces of broken concrete free of soil, protruding reinforcing steel, bituminous and other similar materials, with a minimum thickness of 8-inches (200 mm) and a least surface dimension of 12 to 16-inches (300 to 400 mm) measured parallel to the slope. Maximum to minimum ratio shall not exceed 3:1.

2.07 Precast Concrete Block

A. Precast concrete block shall be factory cast concrete units of the sizes indicated on the Plans. Precast concrete block shall attain a minimum compressive strength of 3,000 psi (24 MPa) in 28 days and have a maximum water absorption rate of ten (10) pounds per cubic foot (160 kg/m^3) when tested in accordance with ASTM C140 with the following exceptions:

B. Compressive Strength:

1. Compression test specimens having surface dimensions of 4" x 4" inches (100 mm x 100 mm) will be sawed from the units. The specimen will be tested with the load applied in the direction of the unit thickness.

C. Absorption:

1. The amount of absorption of water shall be determined on half of the same unit from which the compression test specimen was sawed.

2.08 Precast Concrete Grid Slope Pavers

A. Precast concrete grid slope pavers shall conform to the minimum physical properties listed below:

1. Length ..... 23 inches (580 mm)
2. Width ..... 15 inches (380 mm)
3. Thickness ..... 4 inches (25 mm)
4. Area, Gross ..... 345 in2 (.225 m2)
5. Area, Upper Surface ..... 95 in 2 (600 cm2)
6. Area, Base Surface ..... 326 in 2 (2100 cm2)
7. Bearing Capacity ..... 100 lb./sq.ft. (490 kg/m2)
8. Strength, Compressive ..... 4,000 psi (28 MPa)

2.09 Interlocking Precast Concrete Slope Pavers

A. Interlocking precast concrete slope pavers shall be composed of precast concrete blocks which interlock together either through a mechanical system or through the design of the blocks themselves. The blocks shall be laid on a geotextile fabric.

B. The precast concrete block units shall have the following minimum properties:

1. Compressive Strength ..... 2,500 psi (17 MPa)
2. Weight ..... 25 lbs/sft (125 kg/m2)
3. Thickness ..... 4 inches (100 mm)

C. The system when assembled shall have a minimum of 20% open area suitable for sustaining vegetation.

D. Geotextile fabric shall be either a woven or nonwoven polypropylene with apparent opening size per ASTM D4751 of less than 0.6 mm.

E. The mechanism for interlocking the precast concrete units shall be noncorrosive and suitable for its intended use.

2.10 Preseeded Erosion Control Blankets

A. Soil erosion control blankets shall be a 70 percent straw, 30 percent coconut fiber matrix sewn between two UV stabilized nets, with a cellulose fiber bottom tissue. The blanket shall be composed of:

1. Straw: ..... 0.35 lbs/syd (.20 kg/m^2)min
2. Coconut Fibers: ..... 0.15 lbs/syd (.08 kg/m^2)min

B. The roll shall be a minimum 6.5 feet (2 m) wide. The blanket shall contain a seed mixture. The seed mixture shall consist of:

1. Kentucky Blue Grass ..... 50 percent
2. Red Top ..... 10 percent
3. Rye Grass ..... 35 percent
4. Clover ..... 5 percent

C. The seed mixture shall also conform to Section 32 9219, Seeding. The preseeded erosion control blankets shall be North American Green cell-o-seed, SC150, or ENGINEER approved equal.

2.11 Flagstone

A. Flagstone shall be sound, tough, durable limestone or seasoned sandstone slabs, free from structural defects. Flagstone shall be irregular shaped units of the thickness indicated on the Plans. The aggregate sizes of individual flagstone units incorporated in the overall flagstone work shall be as follows:

1. 25% ..... Approximately 64 in^2 (400 cm^2)
2. 50% ..... Approximately 144 in^2 (925 cm^2)
3. 25% ..... Approximately 324 in^2 (2100 cm^2)

2.12 Stone Fill for Gabions

A. Stone fill used in gabion units shall be sound, tough, durable aggregate with a minimum size of four (4) inches (100 mm) based on U.S. Standard square mesh sieves. Stone shall be free of cracks, seams, and other defects that would unduly increase deterioration of the material from natural causes or reduce its size. The inclusion of objectionable quantities of dirt, sand, clay, and rock fines as determined by ENGINEER will not be permitted. Sound pieces of broken concrete, without protruding reinforcement, may be used in place of stone where approved by ENGINEER.

2.13 Wire Mesh Gabions

A. Galvanized Steel Wire Mesh Gabions:

1. Gabion basket units shall be of nonraveling construction and fabricated from a triple twisted hexagonal mesh of hot dipped galvanized steel wire having a minimum diameter of 0.118 inches (3 mm) after galvanization. The steel wire used shall be galvanized prior to fabrication into mesh. All gabion diaphragm and frame wire shall equal or exceed Federal Specification QQ-W-461g, possess medium tensile strength, and a Finish 5, Class III zinc coating of not less than 0.80 oz/sq. ft. (244 g/m^2) of uncoated wire surface. The test for weight of zinc coating shall be as determined by ASTM A90. The uniformity of coating shall equal or exceed four, 1-minute dips by the Preece Test; ASTM A239.

2. Mesh openings shall be hexagonal in shape, and uniform in size measuring not more than 3-1/4" x 4-1/2" (80 mm x 115 mm). Selvedge or perimeter basket frame wire shall be of heavier gage than the wire mesh with a minimum diameter after galvanizing of 0.150 inches (4 mm). Wire used for lacing or as internal connecting wire within basket cells may be of soft tensile strength and of lighter gage with a minimum diameter after galvanizing of 0.0866 inches (2 mm).

B. Polyvinyl Chloride (PVC) Coated Galvanized Steel Wire Mesh Gabions:

1. Polyvinyl chloride coated gabion basket units shall be of unraveling construction, fabricated from a triple twisted hexagonal mesh of hot dipped galvanized steel wire having a minimum diameter of 0.105 inches (3 mm) after galvanizing and additionally coated with a minimum of 0.020 inches (.5 mm) of PVC. The steel core wire used shall be galvanized and PVC coated prior to fabrication into mesh. The core wire of all gabion diaphragm and frame components shall equal or exceed Federal Specification QQ-W- 461g, shall possess medium tensile strength, and a Finish 5, Class III zinc coating of not less than 0.80 oz/sq. ft. (245 g/m^2) of uncoated wire surface.

2. Mesh openings shall be hexagonal in shape and uniform in size measuring not more than 3-1/4" x 4-1/2" (80 mm x 115 mm). Selvedge or perimeter basket frame core wire shall be of heavier gage than that of the wire mesh with a minimum diameter after galvanization of 0.132 inches (3 mm), and an overall diameter (core wire plus PVC coating) of 0.174 inches (4 mm). Coated wire used for lacing or as internal connecting wire within basket cells may be of soft tensile strength and an overall diameter (core wire plus PVC coating) of 0.127 inches (3 mm). The PVC coated wire of all gabion components shall be resistant to the destructive effects of immersion in acidic, salt, or polluted water, exposure to ultraviolet light and abrasion, and retain these characteristics after a period of not less than 3,000 hours under test in accordance with ASTM G23.

C. Fabrication:

1. Gabions shall be fabricated in such a manner that they can be assembled at the construction site into rectangular baskets of the sizes specified and shown on the Plans. Gabions shall be of single unit construction. The gabion base, lid, ends, and sides shall be either woven into a single unit or one edge of these members connected to the base section of the gabion in such a manner that strength and flexibility at the point of connection is at least equal to that of the mesh. Where the length of the gabion exceeds 1-1/2 its horizontal width, the gabion shall be equally divided by diaphragms of the same mesh and gauge as the body of the gabions, into cells whose length does not exceed the horizontal width. The gabion shall be furnished with the necessary diaphragms secured in proper position on the base in such a manner that, during assembly, no additional tying will be necessary. All perimeter edges of the mesh forming the gabion shall be securely selvedged so that the joints formed by tying the selvedges have at least the same strength as the body of the mesh. Lacing wire or connecting wire shall be supplied in sufficient quantity for securely fastening all diaphragms and edges of the gabion.

2.14 Geotextile Filter Fabric

A. Geotextile filter fabric material shall be a non-woven, needle punched fabric consisting of compositions of at least 85% by weight polyolefins, polyesters, or polyamides. The geotextile filter fabric shall be resistant to chemical attack, rot and mildew and shall have no tears or defects which adversely alter its physical properties. The fabric shall conform to the following physical strength requirements:

Physical Property	Test Procedure	Acceptable Test Results
Tensile Strength	ASTM D4632	200 pound min (0.890 kN)
Puncture Strength	ASTM D4833	100 pound min (0.445 kN)
Elongation	ASTM D4632	15% minimum
Seam Strength	ASTM D4632	180 pounds min (0.800 kN)
Burst Strength	ASTM D3786	400 psi min (2750 kPa)
Trapezoid Tear	ASTM D4533	100 pounds min (.445 kN)
Permittivity	ASTM D4491	0.5 sec^{-1} Minimum
Ultraviolet Degradation	ASTM D4355	70% of min Degradation strength retained after weathering for 500 hours

B. Geotextile filter fabric shall provide an Apparent Opening Size for coarseness or fineness per ASTM D4751 of 70 / 0.21 (U.S. Sieve/ mm) unless otherwise indicated on the Plans.

C. The seams of the fabric shall be sewn with thread of a material meeting the chemical and physical requirements listed above or shall be heat or cement bonded. The strength of seams shall be not less than 90% of the required tensile strength of the filter fabric in any principle direction.

2.15 Burlap Bags

A. Bags shall have maximum dimensions of 18" x 24" (450 mm x 600 mm) and shall be made of ten (10) ounce burlap.

2.16 Acceptable Manufacturers

A. Grid Pavers:

1. Acceptable manufacturers of turf and soil concrete grids include: "Mono Slabs" as distributed by Fendt Builders Supply, Inc., or equal.

B. Gabions:

1. Acceptable manufacturers include: Maccaferri Gabions, Inc.; Bekaert Steel Wire Corp.; or equal.

C. Interlocking Precast Concrete Slope Pavers:

1. Unless indicated otherwise on the plans, acceptable manufacturers include: Tri-lock erosion control system by American Excelsior Company; Flexblock Armored Stabilization Mattress by Earthbase Construction Products or ENGINEER approved equal.

Part 3 Execution

3.01 Verification of Subbase

A. Riprap and Slope Paving Materials:

1. Prior to the installation of any riprap or paving materials, examine the subbase to receive such material for the proper grades and lines required to receive the Work. Ascertain that all subgrades and bedding are adequate to receive slope protection. Correct all defects and deficiencies before proceeding with the Work.

B. Geotextile Filter Fabric:

1. Prior to installation of any geotextile filter fabric, verify that the surfaces to receive fabric are prepared to relatively smooth grades, free of obstructions, depressions, debris and soft or low density pockets of material. Correct all defects and/or deficiencies prior to installation of fabric so that fabric will not be damaged.

3.02 Preparation - General

A. Prepare all surfaces to receive slope protection materials as indicated on the Plans and as specified below.

3.03 Bedding Materials

A. Install all bedding materials of the types indicated on the Plans and as required to receive the slope protection materials.

B. Remove any buried debris protruding through the bedding material that will impede or damage the proper installation or affect the final appearance of the slope protection installations.

C. Fill all voids of installed bedding materials and compact as directed by ENGINEER.

3.04 Examination of Materials

A. Geotextile Filter Fabric:

1. Prior to installation, inspect all geotextile filter fabric for defects, rips, holes, contamination or deterioration. Replace all defective geotextile filter fabric as directed by ENGINEER.

B. Wire Mesh Gabions:

1. Prior to installation, inspect all galvanized and/or PVC coated wire mesh gabions for defects or damage due to manufacture, handling or storage which would substantially affect gabion installation and performance. Replace all defective or damaged wire mesh gabions as directed by ENGINEER.

3.05 Installation General

A. Material for bedding, where required, shall be spread uniformly on the prepared subbase to the slopes, lines, levels and grades indicated on the Plans in a manner satisfactory to ENGINEER. Bedding methods shall not cause segregation of bedding material particle sizes or damage to prepared subbase. Repair all defective or damaged work to the satisfaction of ENGINEER. Bedding shall be compacted and finished to present a reasonably even surface, free from mounds or wind rows.

B. Install formwork for concrete headers, cast-in-place concrete slope paving and weep holes for riprap paving where indicated on the Plans. Forms shall be the full depth of the concrete. Forms shall be firmly staked to the required line and grade. Slab division forms shall be placed so that the slab division joints are straight and continuous.

3.06 Concrete Slope Paving

A. Construct concrete slope paving on the prepared subgrade to the lines and levels and according to the details indicated on the Plans. The prepared subgrade shall be thoroughly wetted and the concrete deposited to the proper depths. The concrete shall be placed in blocks having dimensions indicated on the Plans. Place concrete in alternate blocks. Pour remaining blocks after first blocks are placed.

B. No concrete shall be placed unless the temperature of the air away from artificial heat is at least 25 degrees Fahrenheit (4 degrees Celsius) and rising, unless otherwise allowed by ENGINEER. Place no concrete against frost or frozen materials. Concrete shall not be placed when the temperature of the concrete at the point of placement is above 90 degrees Fahrenheit (32 degrees Celsius). Thoroughly spade concrete along the faces of forms before finishing operations are started. Alternately tamp and strike off concrete with a strike board until all voids are removed and the surface reaches the required grade and cross section.

C. Finish the concrete surfaces with a wood float. Round all edges and joints to a radius of 1/4 inch with an approved finishing tool.

D. The concrete shall be cured for a minimum of four days by being kept continuously wet or by the application of transparent membrane curing compound. Protect the concrete from freezing until the concrete has attained at least 100 psi (0.7 MPa) flexural strength. Protect concrete against foot traffic for a minimum of 24 hours.

3.07 Concrete Headers

A. Construct cast-in-place concrete toe and side headers of the types, sizes and to the lines and levels indicated on the Plans. Placing, curing and protection of concrete headers shall be as described above under Article 3.06, Concrete Slope Paving.

3.08 Geotextile Filter Fabric

A. Place geotextile filter fabric on the prepared subbase in the manner and at the locations shown on the Plans. Fabric shall be laid smooth and free of tension, stress, folds, wrinkles or creases. The fabric strips shall be placed to provide a minimum overlap of 24 inches (600 mm) for each joint. Install securing pins with washers through both strips of overlapped fabric along a line through the midpoint of the overlap at center-to-center spacings as recommended by manufacturer unless otherwise indicated on the Plans. Washers shall bear against fabric to secure firmly to subbase. Additional pins shall be installed as necessary to prevent slippage of the filter fabric. Securing pins shall be steel, 3/16 inch (5 mm) minimum size, pointed at one end, of lengths as recommended by manufacturer unless otherwise indicated on the Plans, but not less than 18 inches (450 mm) long. Washers shall have an outside diameter of not less than 1-1/2 inches (40 mm).

B. Fabric shall be placed so that the upper strip will overlap the next lower strip. Schedule the Work so that fabric is covered with slope protection materials specified within seven days after fabric placing. Failure to comply shall require replacement of fabric. Filter fabric shall be protected from damage by limiting the height of drop of slope protection material or by placing a cushioning layer of sand on top of fabric before placing other material.

3.09 Aggregate Filter Drainage Layers

A. Install aggregate filter drainage layers in the locations and to the lines and levels indicated on the Plans. Gradation of aggregate for filter drainage layers shall be as detailed. Spread and compact aggregate as indicated.

3.10 Precast Concrete Slope Paving

A. Unless otherwise specified, the precast concrete slope paving shall be laid on a prepared subbase as indicated on the Plans. Units shall be laid beginning at toe of slopes. Joints shall be as detailed and shall be filled with mortar. Edges of precast units shall be moist when the mortar is placed. Mortar shall be placed from bottom to top and sufficient mortar shall be used to construct solid joints. Mortar shall be worked with suitably approved tools to completely fill the joints between the units. Excess mortar shall be removed from the surface of the precast concrete units. Precast concrete slope paving shall be cured and protected as specified under Article 3.06 of this Section, Concrete Slope Paving.

3.11 Plain Riprap Slope Paving

A. Stone for riprap shall be placed on the prepared subbase commencing at the toe of the slope and progressing upward; each stone being laid by hand. Stone shall be placed in a manner as to produce a reasonably well graded mass with a minimum practicable percentage of voids. Riprap along the lower edge of an area shall consist of the largest stones. Except for small stones used to fill voids between larger stones, no stone shall be used in the exposed face of the riprap which will extend less than 1/2 the riprap thickness, and shall be placed within the tolerances and to the lines and levels shown on the Plans. Riprap shall be placed to a full course thickness in one operation and in a manner to avoid displacement of subbase. The larger stones shall conform to the gradation indicated on the Plans and be well distributed over the area. Rearranging of individual stones will be required as necessary to obtain a reasonably well graded distribution of stone sizes.

B. The riprap and bedding shall be thoroughly compacted as the construction progresses to provide an even, tight surface. Riprap protection shall be placed as a part of the embankment and with minimum lag in construction of riprap to prevent mixture of embankment and stone protection material.

3.12 Grouted Riprap Slope Paving

A. Stones for grouted riprap shall be laid as specified above for plain riprap. Riprap shall be carefully placed in the prepared subbase to the lines and levels indicated on the Plans, with the joints between the stones left open to receive the grout. Where indicated on the Plans, construct weep holes in the riprap by placing approved forms on the subbase and placing the riprap around the forms. Weep holes shall be filled with the material used for bedding of riprap and, during the grouting work, care shall be taken to prevent mortar from entering the weep holes.

B. Prior to grouting, all surfaces of the riprap shall be thoroughly wetted. The riprap shall be grouted in successive longitudinal strips, approximately ten (10) feet (3 m) in width, starting at the lowest strip and working up the slope. Each batch of mortar shall be placed on the upper portion of the ungrouted portion of the strip and worked into the voids between the stones and down the slopes. Grout shall be distributed over the surfaces of the strips by the use of brooms and worked into place between the stones by the use of spades, trowels, vibrators or other approved equipment. Adequate precautions shall be taken to prevent the grout from penetrating the stone bedding material. Faces of riprap stones shall remain exposed. As a final operation, the grout shall be removed from the top surfaces of the riprap stones and from pockets and depressions in the stone faces by use of a stiff stable broom or brush.

C. Riprap shall not be grouted when the ambient temperature is below 35 degrees Fahrenheit (2 degrees Celsius) or above 85 degrees Fahrenheit (29 degrees Celsius), nor when the grout, without special protection, is subject to freezing temperatures before final set has occurred.

D. Protect grouted riprap surfaces from rain, flowing water and mechanical injury. No workmen or any load shall be permitted on the grouted riprap surfaces for a period of at least 24 hours.

3.13 Grouted Flagstone Slope Paving

A. Flagstone shall be placed on prepared subbase to the lines and levels indicated on the Plans.

B. Prior to placing flagstone, the subbase shall be wetted.

C. Placing of flagstone shall begin from the bottom of the slope and proceed upward, in courses, to the top.

D. The stones shall be laid flat with the smoother faces of the stone exposed.

E. Stone shall be laid with well broken joints and a minimum of space between units. The space between flagstone joints shall be swept clean of sand and other materials to the full depth of the stones and filled with mortar.

F. The edges between the stones and the subbase between the stones shall be wetted and the surfaces damp when the mortar is placed.

G. The mortar shall be placed in such a manner as to fill the joints completely to the full depth of the stones, but no mortar shall be left on top of the stones. Each joint shall be filled with mortar individually.

H. Depositing a volume of mortar on top of the stones and sweeping it into the joints will not be permitted. The top surface of the joints shall be finished flush with the stones, and any excess mortar around the joints or on the face surface of the stones shall be removed with a stiff brush or by other approved means.

I. Grouted flagstone slope paving shall be cured and protected as specified under Article 3.11, Grouted Riprap Slope Paving.

3.14 Precast Concrete Grid Slope Pavers

A. The grid slope pavers shall be placed on a prepared subbase to the lines and levels indicated on the Plans.

B. Placing of pavers shall begin from the bottom of the slope and proceed upward in courses to the top.

C. The lowermost course of pavers shall be laid with the slab longitudinal members horizontal along the bank, succeeding courses shall be laid to the desired height.

D. Where indicated on the Plans and where necessary, provide and install wooden stakes, of sufficient size, to anchor slabs. Stakes shall be placed at the lowermost paving course and, alternately, two (2) or three (3) slab widths apart.

E. When laying is completed, fill the interstices of the slab grids to within 1-inch (25 mm) of the top with earth fill as specified on the Plans.

3.15 Interlocking Precast Concrete Slope Pavers

A. Area(s) to receive interlocking precast concrete slope pavers shall be free of obstructions such as tree roots, rocks, or other protruding objects or foreign materials.

B. Voids or soft areas shall be filled with acceptable material. All areas will be suitably compacted. Where necessary, hand dressing will be required.

C. Interlocking precast concrete slope pavers shall be laid on a geotextile filter fabric. Installation of the geotextile fabric shall occur in stages. Geotextile shall be spread at a maximum rate of 200-250 square yard (165-210 m^2) or that portion of the geotextile fabric which will be covered by block during the work day. Geotextile fabric shall not remain exposed to ultraviolet (U.V.) for extended period.

D. Geotextile fabric shall be anchored using 12" x 3/16" (300 x 5 mm) pins with 1-1/2" (40 mm) diameter washer heads. Pins shall be placed at 2-foot (600 mm) intervals on edges of geotextile and at 3-foot (900 mm) intervals on interior areas of geotextile.

E. An overlap at seams of 24 inches (600 mm) minimum is required.

F. Upper geotextile sections will overlap.

G. Installation of interlocking precast concrete slope pavers shall begin with blocks being placed in a straight line perpendicular to the direction of lay and will continue in a sequential manner. As installation continues, straight lines must be maintained.

H. Key, toe, and flank trenches shall be constructed and backfilled as shown on the plans.

I. When placement of interlocking precast concrete slope pavers is complete, fill voids in lower five feet of pavers with 21A crushed limestone. Fill voids in remaining pavers with topsoil, seed, fertilizer, and mulch.

3.16 Wire Mesh Gabions

A. The empty wire mesh gabion units shall be assembled at the site of the Work in strict accordance with the printed instructions of the manufacturer of the gabion units used. No substitution shall be allowed for lacing wire specified in this Section or that recommended by the wire mesh gabion manufacturer.

B. Empty gabion units shall be placed on the prepared subbase to the lines, levels and grades indicated on the Plans. Units shall be placed with sides, ends and diaphragms erected to insure the correct position of all creases and that tops of all sides are level. After installation, all adjoining empty gabion units shall be connected by tie wire lacing along the perimeter of their contact surfaces to obtain a monolithic structure. Lacing of adjoining basket units shall be accomplished by continuous stitching with alternating single and double loops at intervals of not more than five (5) inches (125 mm). All lacing wire terminals shall be securely fastened. The use of clip connections to effect final lid closing will not be permitted. After the initial course of baskets are placed, they shall be partially filled with stone to provide anchorage against deformation and displacement during filling operation.

C. After adjoining empty baskets are set to line and grade, and common sides with adjacent units, thoroughly laced, the units shall be placed in tension and stretched to remove any kinks in the mesh and to bring units to full, uniform alignment. Stretching of empty basket units shall be done in a manner that will prevent unraveling of wire mesh. For gabion units two (2) feet (600 mm) or more in depth, a minimum of two (2) uniformly spaced connecting wires shall be placed between each stone layer in all cells connecting compartment faces parallel to earth banks.

D. Connecting wires shall be looped around one mesh opening at each basket face and the wire terminals securely twisted to prevent loosening. For gabion units over four (4) feet (1.2 m) in depth, a minimum of two (2) uniformly spaced vertical connecting wires per cell, linking the foundation mesh to the basket lid mesh shall be provided.

The outer layer of stone shall be placed and arranged by hand to insure a neat and compact appearance along all exposed faces. The final layer of stone shall level with the top of the gabion units for proper lid closing. Lids shall be stretched tight over the stone fill using suitable lid closing tools so that the lid meets the perimeter edges of the front and end panels. Tightly lace all edges, ends and internal cell diaphragms.

E. Turn all wire projections into baskets. Where complete gabion units cannot be installed, cut, fold and wire baskets to suit site conditions.

F. Proceed carefully with stone filling operations using hand or machine methods which will not damage the wire mesh coatings of the units. Placing methods shall assure a minimum of voids between stones. Alignment of the gabion basket units shall be maintained throughout the filling operation. Undue bulging or localized deformation of the basket units shall be avoided by filling in stages of 12-inch (300 mm) courses. At no time shall any cell be filled to a depth exceeding 1-foot (300 mm) more than adjoining cells. Maximum stone drops shall be three (3) feet (900 mm).

3.17 Concrete Bag Riprap

A. Bags of unhardened concrete shall be placed as indicated on the Plans, on the prepared subgrade commencing at a concrete base at the toe of the slope and progressing upward.

B. Concrete base shall be no less than 12 inches (300 mm) in width and thickness, with the end of the culvert embedded four (4) inches (100 mm).

C. Concrete, when placed into the bags, shall be wet enough so that when set into place the bags will adhere together to form a solid wall. Bags shall be filled to 2/3 capacity.

D. Steel bars, 1/2 inch (10 mm) diameter and no less than 24 inches (600 mm) long, shall be driven through the top row of bags at 12 inches (300 mm) on center. Protrusion of bars from bags will not be permitted.

E. A 4-inch (100 mm) thick concrete cap shall be placed to the full width and length of the top row of bags.

F. Environmental requirements for the placement of concrete shall comply with Article 3.06 of this Section.

3.18 Field Quality Control

A. Upon completion of the slope protection, the Work shall be final inspected. The final inspection shall consist of a check to confirm the proper placement and backfill of the protection material, assure slopes and elevations as indicated on the Plans and completion of related earth Work.

End of Section

Section 32 1123
Aggregate Base Courses

Part 1 General

1.01 Scope of Work

A. This Section includes aggregate base courses complete with aggregate materials constructed in preparation for paving or aggregate surfacing.

1.02 Related Work Specified Elsewhere

A. Section 31 2198: Site Construction Performance Requirements
B. Section 31 2313: Subgrade Preparation
C. Section 32 1216: Bituminous Paving
D. Section 32 1313: Concrete Paving

1.03 Reference Standards

A. Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

1. ASTM - ASTM International

2. AASHTO - American Association of State Highways and Transportation Officials

3. MDOT - Michigan Department of Transportation, 2003 Standard Specifications for Construction

1.04 Allowable Tolerances

A. Finished surface shall be shaped to conform to plan grade and cross section within a tolerance of 3/4 inch in ten (10) feet (30 mm per 5 m).

1.05 Test Reports

A. Testing lab shall provide ENGINEER with two (2) certified copies of the test results of the thickness of the compacted aggregate. Core drilling, testing for thickness and the certification of the test results shall be performed by a testing laboratory approved by ENGINEER.

1.06 Stockpiling Aggregate

A. Aggregate shall be deposited in stockpiles in such a manner that the material may be removed from the stockpile by methods which will provide aggregate having a uniform gradation.

B. Stockpiling of aggregate, in excess of four (4) feet (1.2 m) in depth, on the completed subbase or aggregate surface will not be permitted, except with the approval of ENGINEER.

1.07 Environmental Requirements

A. Comply with the requirements for aggregate base or surfacing installations due to outside ambient air temperatures specified under Article 3.08 of this Section.

Part 2 Products

2.01 Dense-Graded Aggregate

A. Dense-graded aggregate gradation shall conform to ASTM D693 and to dense-graded aggregate, Series 21, and 22, as specified in MDOT, Section 902.06.

2.02 Calcium Chloride Additives

A. Calcium chloride additives shall conform to ASTM D98 and as specified in MDOT, Section 903.02.

2.03 Water

A. Water used for compaction and dust control shall be reasonably clean and free from substances injurious to the finished product. Water from sources approved by the Michigan State Department of Public Health as potable may be used.

Part 3 Execution

3.01 Excavation Verification

A. Prior to the placing of any aggregate material, examine the excavation for the grades, lines, and levels required to receive the new Work. Ascertain that all excavation and compacted subgrades or subbases are adequate to receive the new Work. Correct all defects and deficiencies before proceeding with the Work.

3.02 Subgrade Conditions

A. Prior to the placing of any aggregate material, examine the subgrade or subbase to ascertain that it is adequate to receive the aggregate to be placed. If the subgrade or subbase remains wet after all surface water has been removed, ENGINEER may require the installation of edge drain.

3.03 Existing Improvements

A. Investigate and verify locations of existing improvements, including structures, to which the new Work will be in contact. Necessary adjustments in line and grade, to align the new Work with the existing improvements must be approved by ENGINEER, prior to any changes.

3.04 Preparation of Subgrade or Subbase

A. Subgrade or subbase shall be fine graded to the cross section indicated on the Contract Drawings, and shall be thoroughly compacted prior to the placing of the aggregate material.

3.05 Installation - General

A. Width, thickness, and type of aggregate materials shall be indicated on the Contract Drawings or as directed by ENGINEER.

B. No aggregate material shall be placed until the subgrade, or subbase, or existing aggregate surface has been approved by ENGINEER.

3.06 Installation of Aggregate Base Course

A. Aggregate base course shall be placed by a mechanical spreader or other approved means, in uniform layers to such a depth that when compacted, the course will have the thickness shown on the Contract Drawings.

B. Depth of any one layer, when compacted, shall not be more than eight (8) inches (200 mm). If the required compaction cannot be obtained for the full depth of the aggregate course spread, the thickness of each course shall be reduced or, with the approval of ENGINEER, adequate equipment shall be used to compact the aggregate to the required unit weight.

C. The subgrade or subbase shall be shaped to the specified crown and grade and maintained in a smooth condition. If hauling equipment causes ruts or holes in the subgrade or subbase, the hauling equipment will not be permitted on the subgrade or subbase, but shall be operated on the aggregate base course behind the spreader.

D. Aggregate shall be compacted to at least 98% of maximum unit weight by the use of approved pneumatic-tired compaction equipment or vibratory compactors.

E. Optimum moisture content shall be maintained until the prescribed unit weight is obtained and each layer shall be compacted until the maximum unit weight is attained before placing the succeeding layer.

F. When approved by ENGINEER, additional water may be applied by an approved means, to the aggregate to aid in the compaction and shaping of the material.

G. Motor graders, trimmers or other approved equipment shall be used to shape the aggregate base course and maintain it until the surface course is placed.

H. When hauling material over the base course, subbase or subgrade, CONTRACTOR shall limit the weight and speed of his equipment to avoid damage to the subgrade, subbase or aggregate base course. If the subgrade, subbase or aggregate base course becomes rutted due to CONTRACTOR's operation, the subgrade, subbase or base course shall be removed and replaced, acceptable to ENGINEER, at CONTRACTOR's expense.

I. With the approval of ENGINEER, chloride additives may be used by CONTRACTOR to facilitate his compaction and maintenance of the aggregate surface. Amount and method of combining the chloride additives are at the option of CONTRACTOR and are at his expense.

3.07 Maintenance During Construction

A. Aggregate base course and aggregate surface shall be continuously maintained in a smooth and firm condition during all phases of the construction operation.

B. CONTRACTOR, at his expense, shall provide additional materials needed to fill depressions or bind the aggregate.

3.08 Temperature Limitations

A. Aggregate materials shall not be placed when there are indications that the mixtures may become frozen before the maximum unit weight is obtained.

B. In no case shall the aggregate be placed on a frozen subgrade or base course unless otherwise directed by ENGINEER.

3.09 Testing

A. During the course of the Work, ENGINEER may require testing for compaction or density and for thickness of material. Testing and coring required shall be performed by a testing laboratory acceptable to OWNER and approved by ENGINEER. Cost for testing and coring shall be at the expense of OWNER.

B. When thickness tests are done, a minimum of one depth (thickness) measurement will be made every 400 linear feet (120 m) per traffic lane. Llane width shall be as indicated on the Contract Drawings or as determined by ENGINEER.

1. If two (2) lanes are constructed simultaneously, only one test is necessary to represent both lanes.

2. For areas such as intersections, entrances, cross-overs, ramps, widening strips, acceleration and deceleration lane, at least one depth measurement will be taken for each 1,200 square yards (1000 m^2) of such areas or fraction thereof.

3. Location of the depth measurement will be at the discretion of ENGINEER.

C. The maximum unit weight shall be understood to mean the maximum unit weight per cubic foot (or cubic meter) as determined by ASTM D1557, Method D.

3.10 Defective Work

A. Thickness:

1. Measurements of aggregate base course thickness will be made to the nearest 1/4 inch (5 mm).

a. Depths may be 1/2 inch (10 mm) less than the thickness indicated on the Contract Drawings provided that the average of all measurements taken at regular intervals shall be equal to or greater than the specified thickness.

b. In determining the average in place thickness, measurements which are more than 1/2 inch (10 mm) in excess of the thickness indicated on the Contract Drawings will be considered as the specified thickness plus 1/2 inch (10 mm).

2. Locations of the depth measurements will be as specified herein unless otherwise directed by ENGINEER. Sections found to be deficient in depth shall be corrected by CONTRACTOR using methods approved by ENGINEER.

B. Weight:

1. When the aggregate material is measured by weight in Tons (or metric tons), the pay weights for aggregates will be the scale weight of the material, including admixtures, unless the moisture content is more than six (6) percent.

a. Moisture tests will be made at the start of weighing operations and at any time thereafter when construction operations, weather conditions or any other cause may result in a change in the moisture content of the material.

b. If the tests indicate a moisture content in excess of six (6) percent, the excess over six (6) percent will be deducted from the scale weight of the aggregate until such time as moisture tests indicate that the moisture content of the material is not more than six (6) percent.

End of Section

Section 32 1216
Bituminous Paving

Part 1 General

1.01 Scope of Work

A. This Section includes bituminous paving complete with bituminous materials; bituminous mixtures; installation of bituminous base course, bituminous wearing course, and bituminous curbs; construction of bituminous pavement, sidewalks, drive approaches, and tennis courts, cold milling and pulverizing existing pavements.

1.02 Related Work Specified Elsewhere

A. Section 31 2198: Site Construction Performance Requirements
B. Section 31 1100: Clearing and Grubbing
C. Section 31 2313: Subgrade Preparation
D. Section 32 1123: Aggregate Base Courses
E. Section 32 1723: Pavement Markings

1.03 Reference Standards

A. Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

1. ASTM - ASTM International

2. AASHTO - American Association of State Highways and Transportation Officials

3. MAPA - Michigan Asphalt Paving Association

4. MDOT - Michigan Department of Transportation, 2003 Standard Specifications for Construction

1.04 Allowable Tolerances

A. Following the final rolling, the surface will be tested longitudinally using a 10-foot (3 m) straightedge at locations selected by ENGINEER. Variation of the surface from the testing edge of the straightedge between any two (2) contacts with the surface shall at no point exceed the following limits:

1. For Bituminous Base Course Mixtures:

a. Multiple Courses:

(1) 3/8 inch (9 mm) for top course
(2) 3/4 inch (20 mm) for lower courses

2. For Bituminous Surface Course Mixtures:

a. Multiple Courses:

(1) 1/8 inch (3 mm) for top course
(2) 1/4 inch (5 mm) for lower courses

b. Single Course: 1/4 inch (5 mm)

B. Variations in excess of the specified tolerance shall be corrected as determined by ENGINEER.

1.05 Material Reports

A. At the request of ENGINEER, CONTRACTOR shall provide ENGINEER with certification that the various materials to be used conform to the ASTM Standards referred to in the Specifications.

B. CONTRACTOR shall provide ENGINEER, or his authorized representative, with the certified batch plant delivery tickets prior to the placing of the materials.

C. CONTRACTOR shall supply ENGINEER with a certified job mix design for each type of bituminous mixture used on this Project.

1.06 Test Reports

A. Testing lab shall provide ENGINEER with two (2) certified copies of the test results of the mix design and the thickness of the bituminous paving material. Core drilling, testing for mix design and thickness, and the certification of the test results shall be performed by a testing laboratory approved by ENGINEER.

1.07 Environmental Requirements

A. Comply with the requirements for bituminous concrete installation due to outside ambient air temperatures specified under Article 3.22 of this Section.

Part 2 Products

2.01 Blended Aggregate

A. The blended aggregate shall conform to ASTM D692, D1073; AASHTO M29, and as specified in MDOT, Sections 501 and 902. Aggregates for bituminous mixtures shall conform to the applicable requirements of Table A: Composition of Bituminous Mixtures and Table B: Mix Design Criteria.

2.02 Mineral Filler

A. The mineral filler gradation shall conform to AASHTO M17 and to mineral filler, 3MF, as specified in MDOT, Section 902.12.

2.03 Anti-Foaming Agents

A. The anti-foaming agents shall conform to anti-foaming agents, as specified in MDOT, Section 904.

2.04 Asphalt Binder

A. Asphalt binder for use in production of bituminous mixtures shall Be Performance Graded Asphalt Binder, PG58-28, per MDOT Section 904, unless otherwise indicated on the Plans.

2.05 Liquid Asphalts

A. Liquid asphalts for use in pavement construction shall conform to ASTM D2026, D2027, and D2028, AASHTO M81 and M82, and as specified in MDOT, Section 904.

2.06 Emulsified Asphalt (Bond Coat)

A. Emulsified asphalt for use in pavement construction shall conform to ASTM D244, and as specified in MDOT, Section 904.

2.07 Composition of Mixtures

A. Bituminous mixtures shall be mixed and placed in accordance with applicable requirements specified in MDOT Sections 501 and 502 except as otherwise specified in this Section.

B. Blended aggregate used for the bituminous wearing course on this Project shall have an Aggregate Wear Index (AWI) of 260, or higher.

C. Aggregates, mineral filler (if required), and asphalt binder shall be combined as necessary to produce a mixture proportioned within the master gradation range limits shown in Table A and meeting the uniformity tolerance limits shown in Table C.

D. Composition limits in Table A are shown in percent by weight, based on the total aggregate, including mineral filler, in the mixture.

E. Bituminous mixture specified on the Plans or in the Proposal, when tested at optimum asphalt content (determined in accordance with MDOT Procedures Manual for Mix Design Processing), shall meet the requirements for stability, flow, voids in mineral aggregate (VMA), air voids, fines/binder ratio, fine aggregate angularity, L.A. Abrasion loss, and soft particles as specified in Table B, Mix Design Criteria.

F. Mixtures failing to meet the requirements specified in Table B will be rejected and the CONTRACTOR will be required to submit additional samples of bituminous mixtures until a combination of material is found which will produce a mixture meeting the Table B requirements.

G. If there is a change in the source of any of the aggregates, a new job-mix formula will be required.

H. After the job-mix formula is established, the aggregate gradation and the asphalt binder content of the bituminous mixture furnished for the Work shall be maintained within the Range 1 uniformity tolerance limits permitted for the job-mix formula as specified in Table C.

1. If two (2) consecutive aggregate gradations on one (1) sieve, or asphalt binder contents as determined by the field extractions are outside the Range 1 but within the Range 2 uniformity tolerance limits, CONTRACTOR shall suspend all operations. (Work days will be charged during the down time.)

2. Before resuming any production, CONTRACTOR shall make all necessary alterations to the materials or plant so that the job-mix formula can be maintained within the deviations permitted under Table C.

I. CONTRACTOR shall provide uniformity in the gradations of the aggregates placed in the cold feed bins so that the combination of aggregates produced for the mixture by blending the aggregates from two (2) or more cold feed bins will be uniformly fed by means of adjustable feeders onto a belt supplying the asphalt plant.

1. Feeders shall be equipped with cutoffs which will automatically stop the operations to the asphalt plant at any time the flow of any aggregate fraction is changed so as to affect the uniformity of the finished product.

J. CONTRACTOR has the option of using hot bins for proportioning the aggregates to meet the specified tolerances.

K. Aggregate gradation tests will be made on aggregate extracted from samples of bituminous mixture taken from the trucks as directed by ENGINEER. As a general guideline, samples will be taken at initial start of production and at other times when tests indicate that the aggregate gradation is fluctuating, truck samples will be taken at a frequency of one (1) sample per 250 Tons (225 metric tons) of mixture, but not more than four (4) samples per day. During other periods where tests indicate the aggregate gradation is stable, truck samples will be taken at a frequency of one (1) sample per 500 Tons (450 metric tons) of mixture, but no more than two (2) samples per day.

1. Mixtures exceeding the maximum tolerances listed in Range 2 under Table C, or exceeding the maximum limits specified for the master gradation range will be rejected and CONTRACTOR may be required to remove and replace any bituminous pavements which ENGINEER determines were constructed with mixtures in the excess of these tolerances.

2. Exact mixture proportions will be based on composite samples of aggregate and the particular bituminous material called for on the Plans and in the Proposal.

Part 3 Execution

3.01 Excavation

A. Prior to the installation of any bituminous concrete pavement, examine the excavation for the grades, lines, and levels required to receive the new Work. Ascertain that all excavation and compacted subgrades are adequate to receive the bituminous pavement to be installed. Correct all defects and deficiencies before proceeding with the Work.

3.02 Subgrade and Base Course Conditions

A. Prior to the installation of any bituminous pavement, examine the subgrade and base course to ascertain that it is adequate to receive the bituminous concrete pavement to be installed. If the subgrade remains wet after all surface water has been removed, ENGINEER may require the installation of edge drain.

3.03 Existing Improvements

A. Investigate and verify location of existing improvements, including structures, to which the new Work is to be connected. Adjustments in line and grade to align the new Work with the existing improvements must be approved by ENGINEER, prior to any changes.

3.04 Equipment Requirements

A. General:

1. CONTRACTOR shall furnish sufficient equipment for completing the Work in a timely and efficient manner.

2. Equipment shall be on the job site and ready for normal operation before the placing of material is started.

   a. Equipment shall be in good working order and of sufficient capacity that the operation can be continuous and a rate of production obtained which insures good workmanship, and eliminates overloading of the equipment or frequent interruptions or delays..

   b. Equipment shall be subject to inspections and testing during construction.

   c. Equipment shall conform to the requirements as specified in MDOT, Section 502 and as specified herein.

B. Pavers:

1. Paver shall be an approved self-powered machine capable of spreading and finishing the mixture in a uniform layer at the desired thickness and cross section and ready for compaction. The use of any machine in poor mechanical or worn condition, will not be permitted. Paver shall be of such design that the supporting wheels, treads, or other devices ride on the prepared base. The full width of surface being applied shall be screeded by an oscillating or vibrating screed.

2. Paver shall at all times produce a uniformly finished surface, free from tearing or other blemishes that would require hand work. Screed shall be adjustable to provide for tilting to secure the proper dray or compressive action necessary to produce the desired surface texture.

3. Paver shall be equipped with a hopper and an automatic material-depth control device so that each distributing auger and corresponding feeder shall respond automatically to provide for a constant level of mix ahead of the screed unit to the full width of the lane being paved.

4. In order to ensure that adequate material shall be fed to the center portion of the lane being paved, reverse pitch augers or paddles shall be installed at the inside of one or both ends of the auger shafts to force the mix to the middle portion of the lane. If necessary to prevent segregation of the mix as it drops off the feed conveyor, baffle plates shall be installed at the required location.

5. When extensions are added to the paver, they shall be provided with the same vibrating screed or tamper action as the main unit of the paver, except for paving variable width areas. Extensions shall also be equipped with a continuation of the automatically controlled spreading augers. Screed and extensions shall be provided with an approved method of heat distribution.

6. Unless specified otherwise, bituminous pavers shall be equipped with an automatically controlled and activated screed and strike-off assembly capable of grade reference and transverse slope control. A manufacturer approved grade referencing attachment, not less than 30 feet (9 m) in length, shall be used for all lower courses and the first lane of the wearing course. After the first lane of the wearing course has been placed, a 10-foot (3 m), or longer, grade referencing attachment may be substituted for constructing subsequent adjacent lanes of wearing course mixture.

7. A self-propelled mechanical spreader capable of maintaining the proper width, depth, and slope without causing segregation of the material, may be used for base courses and for surface courses less than eight (8) feet (2.4 m) in width.

8. When surfacing ramps or shoulders, or when the grade of a concrete gutter or other existing installation must be met, the manner of use of the automatic grade reference and slope control devices shall be determined by ENGINEER.

9. Whenever a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually for the remainder of the normal working day, provided this method of operation will produce results meeting the specification requirements.

C. Crushing Equipment:

1. Crushing equipment for pulverizing existing bituminous base course shall be an approved rotary reduction machine having positive depth control adjustments in increments of ½ inch (10 mm) and capable of reducing material which is at least six (6) inches (150 mm) in thickness. The machine shall be of a type designed by the manufacturer specifically for reduction in size of pavement material, in place, and be capable of reducing the pavement material to the specified size. Cutting drums shall be enclosed and shall have a sprinkling system around the reduction chamber for pollution control. The rate of forward speed must be positively controlled in order to ensure consistent size of reduced material. The machine must be equipped with an accurate tachometer which is mounted in full view of the operator. Crushing equipment shall meet the approval of ENGINEER.

D. Cold Milling Machine:

1. Cold Milling machine for removing concrete or bituminous surfaces shall be equipped with automatically controlled and activated cutting drums that are capable of grade reference, transverse slope control, and produce a uniformly textured surface. An approved grade referencing attachment, not less than 30 feet (9 m) in length shall be used. Equipment for removing the concrete or bituminous surface shall be capable of accurately removing the surface, in one or more passes, to the required grade and cross section.

E. Joint Heaters:

1. Joint heaters shall be infrared or other approved heaters, equipped with an automatic ignition and extinguishing system to ensure that the heater operates only when the paver is moving. It shall be of sufficient length and heating capacity to adequately soften the edge of the mat. The heater shall be oriented parallel to the joint edge. The bituminous pavement shall not be heated by a direct open flame.

F. Rollers:

1. Steel-wheel rollers shall weight at least eight (8) Tons (7 metric tons) and shall be self-propelled, vibratory or static, tandem rollers or shall be self-propelled static 3-wheel rollers.

   a. Steel-wheel rollers shall be free from backlash, faulty steering mechanism, or worn king bolts.

b. Steering device shall respond readily and permit the roller to be directed on the alignment desired.

c. Rollers shall be equipped with wheel sprinklers and scrapers.

d. Roller wheels shall be smooth and free from openings or projections which will mark the surface of the pavement.

2. Vibratory rollers shall have a shutoff to deactivate the vibrators when the roller speed is less than 0.5 mph (.8 km/hr) and shall have provisions to lock in the manufacturer's recommended speed, the vibration per minute, and the amplitude of vibration (dynamic force) for the type of bituminous mixture being compacted.

3. Pneumatic-tired roller shall be of the self-propelled type with a total weight, including ballast, not greater than 30 tons (27 metric tons).

a. It shall be equipped with a minimum of seven (7) wheels situated on the axles in such a way that the rear group of tires will not follow in the tracks of the forward group, but will be so spaced that a minimum tire path overlap of 1/2 inch (10 mm) is obtained.

b. Tires shall be smooth and shall be capable of being inflated to or adapted to achieve a pressure necessary to provide ground-contact pressures of at least 80 pounds per square inch (550 kPa).

c. Tire pressures shall not vary by more than five (5) pounds per square inch (35 kPa) between individual tires.

d. CONTRACTOR shall furnish a tire gage which shall be available at all times to enable NGINEER to check the tire pressures.

e. CONTRACTOR shall furnish ENGINEER charts or tabulations showing the contact areas and the contact pressures for the full range of tire inflation pressures and tire loadings for the type and size roller used.

4. Roller shall be equipped with a mechanism capable of reversing the motion of the roller smoothly. Roller shall be equipped with wheel sprinklers and scrapers or mats.

5. Rollers shall be of sufficient size to compact the bituminous mixture to the required density without tearing, displacing, or cracking the mat.

G. Chip Spreader:

1. Chip spreader shall be self-propelled and shall be equipped with pneumatic tires.

2. Spreader shall be equipped with a screen mounted below the metering gage.

3. Spreader shall be capable of spreading the cover material uniformly at widths of 3 to 12 feet (1 to 3.5 m), or separate spreaders shall be provided for the specific widths required.

a. Rate of discharge of the spreader shall be adjustable to spread uniform layers of 10 to 50 pounds per square yard (5 to 27 kg/m^2).

H. Bituminous Concrete Curbing Machine:

1. Bituminous concrete curbing machine shall be self-propelled and shall be capable of laying and satisfactorily compacting curved and straight line curb to the cross section specified on the Plans. It shall be equipped with templates for the cross sections required.

3.05 Preparation of Foundations

A. For bituminous base course mixtures required to be placed directly on the subgrade, the density, grade and cross section shall meet the approval of ENGINEER at the time of placement of any mixture.

B. Prior to placing any bituminous mixture, the surface of the existing pavement including joints and cracks shall be thoroughly cleaned of all dirt and debris.

C. Existing structures within the limits of the new Work shall be adjusted as specified in the Plans, or as directed by ENGINEER.

3.06 Preparation of Aggregate Base

A. Prior to the placing of any prime coats or any bituminous mixtures, the density, grade and cross section of the aggregate base shall meet the approval of the ENGINEER at the time of placement of any material.

B. Surfaces that have become too wet or too dry shall be reworked to provide the required density.

3.07 Preparation of Existing Pavement

A. This Work consists of preparation of the existing concrete road for resurfacing. All broken pavement or pavement not bonded to the base pavement, and loose bituminous surfacing or patches shall be removed. All longitudinal and transverse joints and cracks shall be cleaned in accordance with Article 3.14, Joint Cleanout. Butt joints at the end of surfacing sections and at intersections of adjoining streets shall be made in accordance with Article 3.08. Vertical face of the cut shall be maintained true, straight and undamaged until installation of wearing course.

3.08 Butt Joints

A. If butt joints are specified on the Plans, or by ENGINEER, the old surface shall be cut back for at least five (5) feet (1.5 m) to a depth of at least 1-inch (25 mm), for the full width of the joint. The vertical face of the cut shall be maintained true, straight and undamaged until installation of wearing course.

3.09 Edge Trimming

A. Trimming and truing the edge of an existing bituminous surface shall be performed as required to give a straight, sharp edge at the proper elevations.

B. The existing base under the bituminous surface shall be left undisturbed.

3.10 Removing Bituminous Surfacing

A. When removing an existing bituminous pavement, the edges of the area to be removed shall be cut along straight lines, either perpendicular or parallel to the direction of travel, for the

full depth of the bituminous surfacing with the cut edge a minimum of 18 inches (450 mm) back from the disturbed edge of pavement.

B. The cutting of the edges and the breaking up of the bituminous material within the removal area, and the removing and disposing of the unsuitable material are included in the Work of removing bituminous surfacing.

3.11 Removing Bituminous Patches

A. Where the removal of bituminous patching material is specified on the Plans or as directed by ENGINEER, it shall be saw cut along the edges of the patched area to prevent the tearing of the adjoining pavement surfaces during the removal operation.

B. Cutting, removing and disposing of bituminous surfacing and unsuitable materials are included in the Work of removing bituminous patches.

3.12 Pulverization and Shaping of Existing Bituminous Base Course

A. This Work consists of scarifying, pulverizing, milling, crushing, adding new material if required, shaping, rolling, compacting, and proofrolling the crushed base to the proper elevation and slope.

B. Additional materials required to fill holes and voids shall be furnished at CONTRACTOR's expense. Additional aggregate, if required shall be 20A or 22A aggregate.

C. The material shall be scarified and uniformly pulverized to a maximum size of two inches (50 mm), in addition, 95 to 100 percent of the material shall have a particle size of 1-1/2 inches (40 mm) or smaller.

D. The material shall be scarified and uniformly pulverized, in one or more passes, to the depth specified on the Plans or as determined by ENGINEER.

E. The maximum length or width of roadbed to be scarified and pulverized at any one time shall be as specified on the Plans or as determined by ENGINEER.

F. The crushed material shall be rough graded to within 3/4 of an inch (20 mm) of the grade called for on the Plans, or as directed by ENGINEER. Additional aggregate shall be placed, if necessary, to attain the required cross sections.

G. After the material has been balanced, it shall be thoroughly mixed. In restrictive areas, the material to be mixed may be bladed into a windrow to provide working room for the mixer.

H. The mixed material shall be shaped and compacted in reasonably close conformity with the lines, grades, and cross sections shown on the Plans or as established by ENGINEER. Excess material shall be removed and disposed of by CONTRACTOR at his expense.

I. Finished rolling shall be done with a vibratory steel wheel roller.

J. Aggregate-bituminous pavement mixture shall be compacted to not less than 95 percent of the unit weight obtained by the AASHTO T180 test method. The test shall be made on the aggregate-bituminous mixture at the field moisture content existing during the compacting operation. Required density shall be maintained until the material has been surfaced.

K. Prior to the placing of any surface courses, the pulverized material shall be proofrolled. Proofrolling shall be accomplished with an 18,000 pound (82 000 kg) single axle load. Unstable areas shall be removed and backfilled.

3.13 Hand Patching

A. Where the filling of holes and depressions in the base or the replacing of the patches is specified on the Plans or as directed by ENGINEER, the filler material shall be an approved bituminous mixture.

B. The mixture selected will be dependent on the depth and size of the patch and the type of mixture and performance grade of the asphalt binder required.

C. Patches shall be compacted to the required grade by use of a machine vibrator or approved roller.

3.14 Joint Cleanout

A. Where joint cleanout is specified on the Plans or as directed by ENGINEER, the joint sealants and foreign material shall be removed to a minimum depth of 1-inch (25 mm) by approved mechanical or hand methods.

B. Removal and disposal of unsuitable materials and the removal and disposal of bituminous surface patches adjacent to joints are included in the Work for joint cleanout.

3.15 Repairing Pavement Joints

A. Where existing pavement joints and cracks are to be repaired, as specified on the Plans or as directed by ENGINEER, the existing bituminous surface and any loose or spalled concrete around the joints and cracks shall be removed.

B. Each joint or crack shall be cleaned and shall be filled with an approved mixture and the mixture shall be compacted with a vibratory machine or by an approved method.

3.16 Cold Milling Concrete or Bituminous Pavement

A. Where cold milling concrete or bituminous pavement is specified, the pavement shall be milled to the shape and cross section as shown on the plans. Immediately after cold milling, the surface shall be cleaned. CONTRACTOR shall remove and dispose of any resulting debris.

B. When allowed by ENGINEER, milling materials may be used for temporary wedging.

1. Prior to placing pavement, temporary wedging materials shall be removed and disposed of.

2. Wedging with milled materials is incidental to the Project.

3.17 General Bituminous Pavement Installation Requirements

A. The width, thickness and type of bituminous paving improvement shall be specified on the Plans, indicated in the Proposal or as determined by ENGINEER.

B. At street intersections, curb drops conforming to the current rules and regulations of Act 8, Michigan PA 1973, as amended, shall be provided for the construction of sidewalk ramps. In addition, curb drops for sidewalks and driveway approaches shall be provided in locations called for on the Plans or as determined by ENGINEER.

C. Existing improvements, including structures, shall be protected to prevent their surfaces from being discolored during application of bituminous materials.

3.18 Bituminous Prime Coat or Bond Coat

A. The prepared foundation shall be treated with bituminous material for prime coat or bond coat as specified. A bond coat shall be applied to each layer of bituminous mixture before the succeeding layer is placed.

B. Bituminous material shall be applied uniformly by means of a pressure distributor, and only in such areas as may be inaccessible to the regular distributor operation shall the bituminous material be applied by means of the hand spraying apparatus of the distributor.

1. Where necessary to accommodate traffic, the surface shall be treated half-width or as recommended by ENGINEER.

2. Foundation shall be free from moisture when the treatment is applied.

3. Under no circumstances shall pools of bituminous material be allowed to remain on the surface.

C. The amount of prime coat to be applied per square yard shall be 0.05 gal/s.y (250 ml/m^2) unless otherwise specified on the Plans or recommended by ENGINEER.

D. When prime coat is applied, the surface course shall not be placed until the prime coat has been properly cured. No blotting of the prime coat with aggregate in lieu of proper curing will be permitted.

E. Prime coat may be omitted or reduced when authorized by ENGINEER.

F. Bond coat shall be applied at the rate specified by ENGINEER. This rate will be between 0 and 0.10 gallons per square yard (0 to 450 ml/m^2) on the bituminous or concrete foundation and between 0 and 0.05 gallons per square yard (0 to 250 ml/m^2) between subsequent courses.

G. Bond coat material shall be applied ahead of the paving operation for a distance of at least 1,500 feet (450 m), depending on traffic conditions, as determined by ENGINEER. The surfacing shall not be placed until the bond coat has cured.

3.19 Transportation of Mixtures

A. The transportation of the mixtures as specified shall be in accordance with MDOT, Section 502.

3.20 Placing Bituminous Mixtures

A. Pavers will be required to have an automatically controlled and activated screed and strike-off assembly except when placing mixtures for:

1. Variable width sections;

2. Sections of pavement less than 1,000 feet(300 m) in length;

3. Placing the first course of a base course mixture on an earth grade or on a sand subbase; or,

4. Placing base course mixtures in widths less than eight (8) feet (2.5 m).

B. Bituminous base course mixtures shall not be placed in lifts exceeding three (3) inches (75 mm), unless otherwise approved by ENGINEER.

1. Approval to place lifts in excess of three (3) inches (75 mm) will be based on the ability of CONTRACTOR to place and compact the base course to the required cross section and within the specified tolerances.

C. For lifts of 2-1/2 inches (65 mm) or greater, a berm of shoulder material shall be banked against the outside edge of each layer of mixture placed unless the sequence of operations is such that the edges of the material are adequately confined and supported in some other manner.

1. The width of material placed shall be twice the height of the bituminous layer being placed but in no case less than a 6-inch (150 mm) width.

D. When the application rate for a bituminous wearing course exceeds 220 pounds per square yard (120 kg/m^2), the pavement shall be constructed in two (2) or more courses, unless otherwise specified on the Plans or as authorized by ENGINEER.

E. Bituminous mixture shall be placed by an approved self-propelled mechanical paver to such a depth that when compacted, it will have the thickness specified.

1. The mixture shall be dumped into the center of the hopper and care shall be exercised to avoid overloading the paver and spilling the mixture upon the base.

2. The paver speed shall be adjusted at the discretion of ENGINEER to that speed which, in his opinion, gives the best results for the type of paver being used and which coordinates satisfactorily with the rate of delivery of the mixture to the paver to provide a uniform rate of placing the mixture without intermittent operation of the paver.

F. When delays result in slowing paving operations such that the temperature of the mat immediately behind the screed falls below 170 degrees Fahrenheit (75 degrees Celsius), paving shall be stopped and a transverse construction joint placed.

G. Bituminous mixture shall be placed in one (1) or more layers as called for on the Plans or as approved by ENGINEER.

1. To take out irregularities in the existing road surface, wedging with bituminous mixture shall be done by placing several layers with the paver.

2. Corrections to the foundation by wedging with bituminous material shall be made by placing, compacting, and allowing the material to cool prior to paving.

H. Bituminous mixtures shall be placed using two (2) pavers in echelon or one (1) paver equipped with an approved joint heater.

1. ENGINEER may omit the use of the joint heater if the temperature of the previously placed mat does not fall below 170 degrees Fahrenheit (75 degrees Celsius) prior to placement of the adjacent course.

I. Echelon paving will be permitted when allowed by ENGINEER.

J. Cold joints will be permitted along acceleration and deceleration lanes, lanes less than full width, irregularly shaped sections, and at transverse joints.

1. Edges of the initial mat for all cold joints shall be painted with bituminous material before the bituminous mixture is placed in the adjacent section.

2. In placing the bituminous mixture adjacent to all joints, hand raking or brooming will be required to provide a dense smooth connection.

K. Connections with existing surfaces at the beginning and ending of resurfacing sections and at intersections shall be made by feathering out the mix, by constructing a butt joint, or as approved by ENGINEER.

L. When placing the bituminous mixture in a lane adjoining a previously placed lane, the mixture shall be placed such that it uniformly overlaps the first lane by two (2) to four (4) inches (50 to 100 mm) and is placed at a height above the cold mat equal to the breakdown roller depression on the hot mat.

1. Overlapping material shall be bumped, back onto the hot lane so that the roller will compress the excess material into the hot side of the joint.

2. If, in the opinion of ENGINEER, the overlap is excessive, the excess material shall be trimmed so as to leave an edge having a uniform thickness.

3. Excess material shall be discarded; it shall not be spread across the surface course.

M. If the lanes are being constructed with two (2) or more pavers in echelon, the loss depths of bituminous material from each paver shall match at the longitudinal joints.

3.21 Rolling and Compacting of Bituminous Mixtures

A. Each layer of bituminous mixture shall be compacted with approved rollers. At least two (2) rollers will be required when the mixture lay-down rate exceeds 800 square yards (650 m^2) per hour.

B. Steel 3-wheel rollers may be used for initial compaction immediately following the paver.

C. The final rolling operation on each layer of bituminous mixture shall be accomplished by use of tandem steel-wheel rollers or by use of vibratory rollers operated in the static mode.

D. Roller wheels shall be kept properly moistened with water.

E. Pneumatic-tired rollers shall be operated in a competent manner and shall not mark or rut the surface or displace the pavement edges.

1. Pneumatic-tired roller shall be ballasted to obtain the required ground-contact pressures as directed by ENGINEER.

2. To obtain a uniformly textured mat and the desired pavement density, ENGINEER may recommend CONTRACTOR to raise or lower tire pressures at any time during the rolling operations.

3. Roller operations shall be conducted in such a manner as to prevent scuffing or chatter marks in the pavement surface.

4. The number of passes made by the pneumatic-tired roller shall not be less than two (2) round trip passes over each area.

F. Rolling of the mixture shall begin as soon after placing without undue displacement, picking up the mat, or cracking.

1. Rolling shall start longitudinally at the extreme sides of the lanes and proceed toward the center of the pavement, overlapping on successive trips by at least half the width of the drive wheel of the roller.

2. Alternate trips of the roller shall be of slightly different lengths.

3. The maximum roller speed shall not exceed the manufacturer's recommended speed for the type of mixture or thickness of layer being placed.

G. When compacting an adjoining lane, the longitudinal joint shall be rolled first with the roller supported mainly on the cold lane with only three (3) to six (6) inches (75 to 150 mm) of the roller extending onto the freshly placed bituminous material.

H. Finish rolling shall continue until all roller marks are eliminated.

I. Pneumatic-tired rollers will not be permitted on wearing courses.

J. Areas too narrow to be rolled directly by standard 8-Ton (7 metric ton) tandem rollers shall be compacted by self-propelled trench rollers of suitable width, approved by ENGINEER, and weighting not less than 300 pounds per inch of width (5500 kg/m).

K. Skin patching on an area that has been rolled will not be permitted. Any mixture that becomes mixed with foreign material or is in any way defective shall be removed and replaced at CONTRACTOR's expense.

L. See Article 3.31 of this Section for compaction test.

3.22 Weather and Seasonal Limitations

A. Bituminous mixtures shall not be placed nor the prime coat or bond coat applied when rain is threatening or when the moisture on the existing surface would prevent satisfactory bonding.

B. Unless otherwise approved by ENGINEER in writing, minimum mixture temperature limitations at the time of placement, and seasonal limitations for placing bituminous mixtures shall be in accordance with the following:

C. Seasonal Limitations:

1. Upper Peninsula.....June 1 - Oct 15
2. Lower Peninsula, north of M-46.....May 15 - Nov 1
3. Lower Peninsula, south of M-46.....May 5 - Nov 15

Mix Temperature Placement Limitations:			
Temperature of Surface being Overlayed ℉ (℃)	Rate of Application of Bituminous Material, lbs/syd (kg/m^3)		
	< 120 (65)	120 – 200 (65 – 110)	> 200 (110)
35 – 39 (2 – 4)	-	-	329 (165)
70 – 78 (21 – 25)	302 (150)	289 (142)	275 (135)
79 – 86 (26 – 30)	289 (142)	275 (135)	275 (135)
86 and Over	275 (135)	275 (135)	275 (135)

D. Bituminous paving will not be allowed below these minimum temperatures, nor when there is frost on the grade or existing surface.

3.23 Heating Bituminous Materials

A. Bituminous material which requires heating before application shall be heated in such a manner as to insure a uniform temperature throughout the entire mass with efficient and positive control at all times. It shall be heated to a temperature consistent with the type of material used and only to such temperature as will insure the necessary fluidity.

1. Excessively high temperatures shall be avoided.

2. A thermometer shall be provided to enable ENGINEER to observe the temperature at any time.

3. Bituminous material which has been overheated will be rejected.

B. Asphalt emulsion shall be circulated continuously when heated above atmospheric temperature so as to prevent it from separating.

1. Heating of asphalt emulsion to the required temperature for application shall be done entirely in the distributor unless a uniform temperature is maintained in the storage tank by means of a circulating heater.

2. Asphalt emulsion which has been damaged by continuous heating for too long a time or by alternate heating and cooling will be rejected.

3.24 Patching

A. Where patching is required on a bituminous surface or concrete surface because of small holes or pitted surface, the holes shall be cleaned of all dirt and foreign material.

B. The bituminous patching material shall be placed, struck off and compacted so that when completed, the patch shall be flush with the adjacent pavement. The compaction may be done with a hand tamper, vibratory compactor or roller.

C. When patching is required for repairing a cut in the pavement, made for the construction of underground structures and utilities, the granular backfill shall be compacted to not less than 95% of the maximum unit weight.

An aggregate base material of not less than 12 inches (300 mm) compacted thickness, or a bituminous base of the specified thickness, shall be used. The top of the base shall be 2 to 2-1/2 inches (50 to 65 mm) below the surface of the adjacent pavement. Bituminous patching material shall be placed and compacted.

D. The surface of the bituminous patch shall be smooth and shall not vary more than 1/4 inch (5 mm) from the crown and grade of the adjacent pavement. Variations over 1/4 inch (5 mm) from the established grade shall be corrected as determined by ENGINEER.

3.25 Chip Seal

A. Seal coating shall consist of one (1) or more applications of bituminous material applied to the prepared surface and one (1) or more coverings of coarse or fine aggregate applied to the bituminous material.

B. Asphalt Emulsion shall be HFRS-2M or CRS-2M and aggregate shall be 29A unless otherwise specified on the plans.

C. Cover materials used for seal coating shall be sufficiently dry when it comes in contact with bituminous material. The moisture content shall not exceed three (3) percent by weight, dry basis. Satisfactory means shall be provided for the protection of the coating materials against excessive moisture by covering stockpiles, by aeration or through manipulation.

D. The bituminous material specified for surface coat shall be uniformly applied by means of the pressure distributor in the number of applications provided and in the amount per square yard as determined by ENGINEER. Each application of bituminous material shall cure sufficiently to prevent displacement or pickup by traffic or construction equipment before a succeeding application of bituminous material is made.

E. Following the application of surface coat bituminous material, the cover material shall be uniformly spread over the surface by means of approved mechanical spreaders, in the amount per square yard as specified or as determined by ENGINEER. Truck wheels shall ride on spread cover material and not on bituminous material.

F. Irregularities or deficiencies in the uniformity of the cover aggregate on the surface shall be corrected by hand spreading and dragging.

G. Following the spreading of each course of cover material, the surface shall be rolled by means of approved rollers.

H. Rolling shall immediately follow the placing of cover material before the bituminous material has set. At no time shall there be more than 300 feet (90 m) of unrolled cover material. No cover material shall be left unrolled for more than five (5) minutes.

I. Sufficient rolling shall be done to embed the cover material in the bituminous material without crushing the aggregate.

J. For areas deficient in cover material after completion of the surface treatment, additional cover material shall be added. For areas with excessive cover material, the excess cover material shall be removed before the next seal is applied. Final application of cover material shall be swept with a power broom.

K. Completed surface shall be maintained with a drag, broom or other approved equipment to keep the material well distributed on the road until all cover material possible has been embedded in the bituminous material. The length of time required for this maintenance will be from two (2) to five (5) days, as determined by ENGINEER, depending on the weather and the materials used.

3.26 Bituminous Concrete Curb

A. Bituminous concrete curb shall be constructed to the design specified on the Plans or as approved by ENGINEER and shall include the conditioning and treating of the surface on which the curb is to be placed.

B. Materials used in the construction and installation of bituminous concrete curbing shall meet the requirements as specified in Part 2, Products of this Section, and as specified in MDOT, Section 904.

C. Bituminous concrete curb mixture shall be 13 or 13A as specified in this Section and in accordance with MDOT, Section 501, unless otherwise approved by ENGINEER.

D. Bituminous curb shall be constructed to conform to the Plans or as determined by ENGINEER. The method of construction shall conform to MDOT, Section 805, unless otherwise specified.

E. Bituminous mixture shall be thoroughly compacted by a curbing machine to the cross section shown on the Plans, or as determined by ENGINEER. The curb shall be formed to the density to produce a tight surface texture. Curbs showing segregation, slumping, or misalignment shall be removed and replaced at CONTRACTOR's expense.

F. When specified on the Plans or as directed by ENGINEER, an application of asphalt emulsion or other approved bituminous coating shall be applied to the finished curb at the joint of the curb and pavement, or to the inside face of the curb, or to both, as a protective seal.

G. Backfilling behind the curb shall not commence until the bituminous mixture has cured.

H. Backfill material shall be placed and thoroughly tamped and compacted to the satisfaction of ENGINEER, without disturbing the curb, and shall be left in a neat and workmanlike condition.

3.27 Bituminous Approaches, Sidewalks, and Shoulders

A. This Work shall consist of constructing a bituminous surface course as specified on the Plans, or as approved by ENGINEER. Bituminous surface course shall be placed on a prepared foundation.

B. Bituminous materials used shall be as specified on the Plans, or as approved by ENGINEER. Materials acceptable for use are specified in Part 2 of this Section, and as specified in MDOT, Section 904.

C. Bituminous approach mixture shall be in accordance with MDOT, Section 501, unless otherwise approved by ENGINEER.

D. Existing pavement or aggregate base shall be prepared to receive the bituminous surface course as specified in this Section.

E. Bituminous prime and bond coats used shall meet the requirements specified in this Section. Care shall be taken to prevent spreading of bituminous material on adjoining surfaces. When approved by ENGINEER, the prime coat may be omitted.

F. The bituminous mixture shall be placed to the thickness specified on the Plans or as determined by ENGINEER.

G. Placing the bituminous mixture shall conform to this Section.

H. When approved by ENGINEER, the paver used for placing bituminous approaches and sidewalks will not be required to have an automatically controlled or activated screed or strike-off assembly or the corresponding grade referencing equipment. Also, with approval from ENGINEER, only one (1) roller may be used with each paver.

3.28 Tennis Courts

A. Bituminous tennis courts shall be constructed to the cross section shown on the Plans, or as determined by ENGINEER.

B. Materials used in the construction of the bituminous tennis court shall meet the requirements specified in Part 2 of this Section, and as specified in MDOT, Section 904.

C. Bituminous base course mixture shall be 13 or 11A as specified in this Section and MDOT, Section 501 unless otherwise specified on the plans.

D. Bituminous surface course mixture shall be 4C, 13A or 36A as specified in this Section and MDOT, Section 501 unless otherwise specified on the plans.

E. Asphalt content and performance grade shall be determined by the job mix formula submitted by the CONTRACTOR and approved by ENGINEER.

F. Bituminous base course and wearing course shall be constructed to conform to the Plan. The method of construction shall conform to MDOT, Section 502, unless otherwise specified.

G. Bituminous bond coat used shall meet the requirements specified in this Section.

H. The rate of application shall be 0.05 - 0.10 gallons per square yard (225 to 450 ml/m^2).

I. For the preparation of the foundation to receive the bituminous base course and bituminous surface course, see the appropriate Articles in Part 3 of this Section.

J. Bituminous base course, if required, and the bituminous surface course shall be installed to thickness shown on the Plans. The method of installation of mixtures shall conform to this Section.

3.29 Cleanup

A. Area adjacent to the new Work shall be backfilled with sound earth of topsoil quality.

B. Backfill shall be compacted, leveled and left in a neat, workmanlike condition. At a seasonally correct time the disturbed area shall be raked, have topsoil placed thereon, fertilized and seeded per the requirements of Section 32 9219, Seeding, or sodded in accordance with Section 32 9223, Sodding.

3.30 Monument Boxes

A. Government, plat, and street intersection monuments within existing or proposed pavement shall be preserved by enclosing in standard monument boxes. Monument box castings shall be furnished and installed by CONTRACTOR and shall be East Jordan Iron Works No. 1570, or approved equal.

B. Existing monument boxes shall be adjusted to meet the proposed pavement elevation by removing the castings and resetting to the required elevation. Support for the monument box shall be concrete bedding, so constructed as to hold them firmly in place. The adjacent pavement, curb, or curb and gutter shall be replaced to the new elevation, condition, and kind of construction, unless otherwise provided.

3.31 Testing

A. During the course of the Work, ENGINEER may require testing for mix designs, aggregate gradation, and physical properties, bitumen content, compaction or density, and thickness of material. Testing and coring required shall be performed by a testing laboratory approved by ENGINEER. Cost for testing and coring shall be at the expense of OWNER. The testing laboratory shall furnish ENGINEER with two certified copies of the results of all tests.

B. Testing procedures shall conform to current MDOT Standards for Construction.

C. Testing of asphalt binders, liquid asphalts, asphalt emulsions, tars shall conform to MDOT, Section 904.

D. Rolling shall proceed until the required compaction is attained and the amount of rolling required shall be based on the test results of a nuclear gage or on using a specified minimum number of rollers. When the total tonnage for the Project is in excess of 1,000 Tons (900 metric tons), the nuclear gage method will be used to govern the compactive requirements.

E. Control density for the bituminous mixture to be placed, will be determined by use of a modified Marshall Test.

F. Control Density:

1. During CONTRACTOR's start-up operations, a rolling procedure to attain the control density will be established.

   a. Rolling procedure will be based on the number and type of rollers used and the rolling pattern.

   b. Goal of the compactive effort will be to establish a rolling procedure which will achieve 100% of the control density but in any case, the density achieved shall not be less than 95% of the control density.

   c. Density values less than 98% will be sufficient cause for ENGINEER to require an adjustment in the number or type of rollers being used or in the rolling pattern.

2. Once the procedure has been established on the start-up section, the procedure shall be used for the remainder of the mixture to be placed, unless subsequent tests indicate a need to change the number of rollers or the rolling pattern.

3. If difficulties are encountered or if there is a significant change in aggregate or bitumen content, ENGINEER will determine the control density for the new mixture and require CONTRACTOR to again establish the number and type of rollers and the rolling pattern required on the new mixture to attain the control density. Compactive procedures thus determined shall be used when placing the remainder of that mixture.

4. Density checks will be made at the discretion of ENGINEER to determine if the compactive procedure being used is achieving the required density, or if a change in procedure is necessary.

5. Each layer of bituminous mixture shall be compacted to at least 95% of the control density, using the established procedure.

3.32 Price Adjustments

A. Samples of asphalt binder may be taken prior to incorporation into the mixture and from the bituminous mixture. Where results of tests on these samples deviate from specification requirements, the affected material will be subject to price adjustments on the following basis:

1. When the test results deviate from the limits specified in MDOT, Table 904-1, Performance Graded Asphalt Binder Specification, by ten (10) percent or more, the mixture produced will be evaluated by ENGINEER and if in his judgment the defective pavement warrants removal, CONTRACTOR shall remove and replace the affected area at his expense. If it is determined that the removal is not required, the Contract unit price of the affected mixture will be reduced by ten (10) percent.

2. Core samples may be taken on the completed Work. If the results from testing of the core samples indicates a deficiency in the completed Work, ENGINEER will evaluate the test results and will recommend removal and replacement or a credit to OWNER.

End of Section

Table A: Composition of Mixtures										
Mixture No.	2B	2C	3B	3C	4B	4C	13	13A	11A	36A
Binder %	4-6	4-6	4.5-7	4.5-7	5-8	5-8	5-8	5-8	4-6	5.5-8
Percent Passing Indicated Sieve										
1-1/2" (37.5 mm)	100	100							100	
1" (25 mm)	99-100	99-100	100	100					90-100	
3/4" (19 mm)	90 max	90 max	99-100	99-100	100	100	100	100	70-95	
1/2" (12.5 mm)	78 max	78 max	90 max	90 max	99-100	99-100	75-95	75-95	55-85	100
3/8" (9.5 mm)	70 max	70 max	77 max	77 max	90 max	90 max	60-90	60-90	40-80	92-100
No. 4 (4.75 mm)	52 max	52 max	57 max	57 max	67 max	67 max	45-80	45-80	25-65	65-90
No. 8 (2.36 mm)	15-40	15-40	15-45	15-45	15-52	15-52	30-65	30-65	15-50	55-75
No. 16 (1.18 mm)	30 max	30 max	33 max	33 max	37 max	37 max	20-50	20-50	10-40	
No. 30 (600 um)	22 max	22 max	25 max	25 max	27 max	27 max	15-40	15-40	7-32	50-20
No. 50 (300 um)	17 max	17 max	19 max	19 max	20 max	20 max	10-25	10-25	5-20	
No. 100 (150 um)	15 max	15 max	15 max	15 max	15 max	15 max	5-15	5-15	4-12	
No. 200 (75 um)	3-6	3-6	3-6	3-6	3-6	3-6	3-6	3-6	3-6	3-10
Crushed Min. %	50	90	50	90	50	90	0	25	25	60

Table B: Mix Design Criteria										
Mixture No.	2B	2C	3B	3C	4B	4C	13	13A	11A	36A
VMA Min. %	13.5	13.5	15	15	16	16	15.5	15.5	13.5	16.5
Air Voids % Target (1)	3	3	3.5	3.5	3.5	3.5	3	3	3	3
Fines/Binder Ratio Max. (2)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Fine Aggregate Angularity Min. (3)	3	4	3	4	3	4	2	2.5	2.5	3
Flow-in. (mm)	.08-.16 (2.0-4.0)	.08-.16 (2.0-4.0)	.08-.16 (2.0-4.0)	.08-.16 (2.0-4.0)	.08-.16 (2.0-4.0)	.08-.16 (2.0-4.0)	.08-.16 (2.0-4.0)	.08-.16 (2.0-4.0)	.08-.16 (2.0-4.0)	.08-.16 (2.0-4.0)
L.A. Abrasion Max. % loss (4)	40	40	40	40	40	40	40	40	50	40
Soft Particle Max. % (5)	12	12	12	12	8	8	8	8	12	8
Stability Min. Pounds (kN)	1200 (5.3)	1200 (5.3)	1200 (5.3)	1200 (5.3)	1200 (5.3)	1200 (5.3)	900 (4.0)	900 (4.0)	900 (4.0)	900 (4.0)

Notes:

(1) The JMF target may be adjusted in the field, prior to placement, to meet the project design criteria for a specific application; for example, 2.0 percent air voids on shoulders or bike paths.

(2) Fines/Binder Ratio. The ratio of aggregate material finer than the No. 200 (75 um) sieve to asphalt binder content by weight including fines and bituminous contributed by reclaimed asphalt pavement (RAP).

(3) The fine aggregate angularity of blended aggregate, determined by MTM 118, must meet the minimum requirement. In mixtures containing RAP, the required minimum fine aggregate angularity must be met by virgin material.

(4) Los Angeles abrasion loss must be met for the composite mixture; however, each individual aggregate must be less than 50.

(5) The sum of the shale, siltstone, structurally weak, and clay-ironstone particles shall not exceed 8.0 percent for aggregates used in top course. The sum of the shale, siltstone, structurally weak, and clay-ironstone shall not exceed 12 percent for base and leveling courses.

Table C: Uniformity Tolerance Limits For Bituminous Mixtures						
Type of Course	Range (a)	Percentage Passing Designated Sieves				Asphalt Binder Content
		(b)	No. 8 2.35 mm	No. 30 600 um	No. 200 75 um	
Top and Leveling Course	Range 1	± 5.0	± 5.0	± 4.0	± 1.0	± 0.40
	Range 2	± 8.0	± 8.0	± 6.0	± 2.0	± 0.50
Base Courses	Range 1	± 7.0	± 7.0	± 6.0	± 2.0	± 0.40
	Range 2	± 9.0	± 9.0	± 9.0	± 3.0	± 0.50

Notes:

(a) This range allows for normal mixture and testing variations. The mixture shall be proportioned to test as closely as possible to the Job Mix Formula.

(b) This includes all sieve sizes No. 4 (4.75 mm) and larger listed on the Job Mix Formula.

Table A[1]: Composition of Mixtures									
Total Percent Passing Indicated Sieve (a)									
Mixture No.	No. 1800 No. 1500 No. 1300 (36A)(36B)	No. 1800 No. 1500 No. 1300 (20AAA)	No. 1100 (36A) (36B)	NO. 1100 (20AA)	NO. 1100 (20A)	No. 900 (20AA)	No. 900 (20A)	No. 900 (20B)	No. 700 No. 500 (20C)
1-1/2" (37.5 mm)	-	-	-	-	-	-	-	-	100
1" (25 mm)	-	-	-	-	-	-	-	-	80-100
3/4" (19 mm)	-	100	-	100	100	100	100	100	-
1/2" (12.5 mm)	100	90- 00	100	90-100	-	90-100	-	-	-
3/8" (9.5 mm)	92-100	65- 5	92-100	65-95	60-90	65-95	60-90	60-95	55-90
No. 4 (4.75 mm)	65-90	55- 5	65-90	-	-	-	-	-	-
No. 8 (2.36 mm)	55-75	45- 0	55-75	45-70	40-65	45-70	40-65	40-70	30-55
No. 30 (600 um)	25-50	20- 5	25-50	20-45	20-40	20-45	20-40	20-45	15-40
No. 200 (75 um)(b)	4 -10	3-0	4-10	3-10	3-10	3-10	3-10	3-10	3-10
Binder % (c)	5-9	5- 9	5-9	5-7	5-7	5-7	5-8	5-8	3-6
Crushed Min. %	(d)	60	(d)	40	25	40	25	-	-

Notes:

(a) Composition limits are shown in percent by weight, based on the total aggregate, including mineral filler in the mixture.

(b) The Job-Mix-Formula shall have a minimum total percent passing a No. 200 sieve of 5.0 percent.

(c) The percent of bitumen in the mixture shown in Table A1 is a range and the actual bitumen content in the production mixture shall be as determined by the Job-Mix-Formula. For mixtures No. 900, 1100, 1300, 1500, and 1800 placed in two courses, the leveling course will be designed to have up to 0.5 percent less bitumen than the optimum specified for the top course. Mixtures No. 500 and 700 will be designed to have a target air void of 4.0 percent.

(d) 36A = 60%, 36B = 40%

Table B[1]: Mix Design Criteria					
Mixture No.	Aggregate Required	Stability Pounds (Minimum)	Flow (.00 inch)	VMA % (Minimum)	Air Voids % Target
500	20jC	500	-	13.0	4.0
700	20C	700	8-16	13.0	4.0
900	20B, 20A, 20AA	900	8-16	13.5	2.5
1100	20A, 20AA, 36A, 36B	1100	8-16	13.5	3.0
1300	20AAA, 36A, 36B	1300	8-16	14.0	3.0
1500	20AAA, 36A, 36B	1500	8-16	14.0	3.0
1800	20AAA, 36A, 36B	1800	9-16	14.0	3.0

Section 32 1313
Concrete Paving

Part 1 General

1.01 Scope of Work

A. This Section includes both plain and reinforced portland cement concrete paving complete with concrete material admixtures, joints, forms, equipment requirements, field quality control and appurtenances required to complete the portland cement concrete paving Work indicated on the Plans.

1.02 Related Work Specified Elsewhere

A. Section 31 2313: Subgrade Preparation
B. Section 31 2319: Dewatering
C. Section 32 1123: Aggregate Base Courses
D. Section 32 1723: Pavement Markings
E. Section 32 9219: Seeding
F. Section 32 9223: Sodding

1.03 Reference Standards

A. Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications.

1. ASTM - ASTM International

2. AASHTO - American Association of State Highway and Transportation Officials

3. ACPA - American Concrete Paving Association

4. MDOT - Michigan Department of Transportation, 2003 Standard Specifications for Construction

1.04 Material Reports

A. At the request of ENGINEER, CONTRACTOR shall provide ENGINEER with certification that the various materials to be used conform to the Standards referred to in the Specifications.

B. CONTRACTOR shall submit a list of his source of material supply to ENGINEER for review prior to placing any order.

C. CONTRACTOR shall provide ENGINEER, prior to the actual delivery of the ready-mixed concrete, the mix design as required by paragraph 5.3.2 of ASTM C94.

1.05 Thickness and Compressive Strength Reports

A. The testing lab shall provide the ENGINEER with two (2) certified copies of the test results of the thickness and compressive strength of the concrete. The core drilling, testing for thickness and compressive strength, and the certification of the test results shall be performed by a testing laboratory approved by ENGINEER.

1.06 Water Quality Test Reports

A. The testing lab shall provide ENGINEER with two (2) certified copies of the test results of the quality of water to be used in the concrete.

B. Sampling and testing of water quality shall be in accordance with AASHTO T-26 requirements, and the certification of the tests' results shall be performed by a testing laboratory approved by ENGINEER.

1.07 Request for Material Variance

A. Requests for variances in the materials, as specified, shall be made in writing to ENGINEER.

B. Two (2) copies of the request shall be submitted for ENGINEER's review and approval.

1.08 Environmental Requirements

A. Comply with the requirements for concrete installation due to outside ambient air temperatures specified under Article 3.22 of this Section.

B. Comply with the requirements for protecting new Work against damage from rain, as specified under Article 3.20 of this Section.

C. Comply with the requirements for protecting new Work against damage from cold weather, as specified under Article 3.21 of this Section.

Part 2 Products

2.01 Cement

A. Cement shall be air-entraining Portland cement conforming to ASTM C150, Type IA or Type IIIA.

2.02 Fine Aggregates

A. Fine aggregate gradation shall conform to ASTM C33 and to fine aggregate, 2NS, as specified in MDOT, Section 902.09.

2.03 Coarse Aggregate

A. Coarse aggregate gradation shall conform to ASTM C33 and to coarse aggregate, 6A, or 6AA as specified in MDOT, Section 902.03.

2.04 Water

A. Water to be used for mixing and curing concrete shall be reasonably clean and free from oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

B. Waters from sources approved by the Michigan State Department of Public Health as potable may be used without testing.

C. Water requiring testing shall be tested in accordance with the current Method of Test for Quality of Water to be used in Concrete, AASHTO T-26, and specified in MDOT, Section 911.

2.05 Concrete Admixtures

A. Air-Entraining Admixtures:

1. Air-entraining admixtures for concrete shall conform to ASTM C260 and as specified in MDOT, Section 903.01.

B. Concrete Accelerators:

1. Chemical admixtures, other than calcium chloride, for accelerating the set of Portland cement concrete shall conform to ASTM C494, Type C or Type E.

2. Calcium chloride in flake or pellet form shall conform to ASTM D98, Type S, Grade 1 or grade 2, flake or pellet form, and as specified in MDOT, Section 903.02.

3. Calcium chloride in solution form shall conform to MDOT, Section 903.02.

C. Water-Reducing and Water-Reducing Retarding Admixtures:

1. Water-reducing admixtures and water-reducing retarding admixtures shall conform to ASTM C494, Type A or Type D, except that neither type of admixture shall contain calcium chloride, and as specified in MDOT, Section 903.03.

D. Pozzolanic Admixtures:

1. Fly Ash shall conform to ASTM C618, Type F, and as specified in MDOT, Section 901.07.

2. Ground granulated blast furnace slag shall conform to ASTM C989, Grade 100, minimum

2.06 Concrete Curing Compounds

A. White membrane curing compound for curing concrete shall conform to ASTM C309, Type 2, Class B Vehicle, and as specified in MDOT, Section 903.05.

B. Transparent membrane curing compound for curing base course concrete shall conform to ASTM C309, Type 1-D, Class B Vehicle, and as specified in MDOT, Section 903.05.

2.07 Lane Tie Bars

A. Bar reinforcement for pavement tie bars shall conform to ASTM A706, or Grade 60 of ASTM A615, A616, or A617, and as specified in MDOT, Section 914.09.

2.08 Steel Welded Wire Fabric

A. Welded steel wire fabric for concrete mesh reinforcement shall conform to ASTM A185, MDOT Section 905.06, and shall be fabricated as shown on the Plans.

2.09 Dowel Bars

A. Dowel Bars and basket assemblies for Transverse expansion and contraction joints shall be ASTM A615 Grade 40 and conform to MDOT Section 914.07.

2.10 Steel Hook Bolts

A. Hook bolts shall conform to ASTM A706, or Grade 60 of ASTM A615, A616, or A617 and as specified in MDOT, Section 914.09. Hook bolts shall be 5/8 inch (16 mm) diameter. Along the edge of existing concrete, expansion anchored hook bolts shall be used.

2.11 Joint Fillers

A. Fiber joint filler material for expansion joints shall conform to ASTM D1751, and as specified in MDOT, Section 914.03.

B. Bituminous premolded joint filler material shall conform to ASTM D994 and AASHTO M33.

C. Polyethylene premolded joint filler for pressure relief joints shall be a flexible, low-density, expanded, extruded polyethylene plank. Polyethylene plank shall be formed by the expansion of polyethylene base resin in an extrusion process and shall be homogeneous, closed-cell and multi-cellular.

2.12 Joint Sealants

A. Hot-poured type joint sealant shall conform to AASHTO M301 or ASTM D3405-97 and as specified in MDOT, Section 914.04.

B. Cold-applied, single component type, joint sealant shall conform to ASTM D5893.

2.13 Concrete Mix

A. Concrete shall contain a minimum of six (6) sacks, 94 pounds per sack, of cement per cubic yard (335 kg/m^3) and shall yield a minimum compressive strength of 3,500 psi (24 Mpa) when cured in a moist room at a temperature within a range of 65 to 75 degrees Fahrenheit (18° to 24° Celsius) for a period of 28 days.

1. Mixes with less than six sacks of cement per cubic yard with water reducers, pozzolans, ground granulated blast furnace slag (GGBFS), etc., may be used when approved by ENGINEER, providing CONTRACTOR provides documentation from actual mixes used on projects showing 28 day compressive strength of not less than 3,500 psi when tested under field conditions.

2. GGBFS or Flay Ash must replace cement on a pound for pound basis. The fly ash quantity may not exceed 15%, GGBFS quantity may not exceed 40%.

B. Cement shall be air-entraining Portland cement ASTM C150, Type IA. If high-early strength concrete is desired, Type IIIA is required.

C. High early strength concrete shall be 4500 psi (31 MPa), 7 sacks cement per cubic yard (390 kg/m^3) with a water reducer. Water cement ratio shall be between 0.38 and 0.39.

D. Air content of the concrete shall be dependent on the maximum size aggregate as follows:

Size of Aggregate in inches (mm)	Air by Volume (in % ±1%)
1-1/2, 2, or 2-1/2 (40 to 65 mm)	5
3/4 or 1 (20 to 25 mm)	6
3/8 or ½ (9 or 10 mm)	7-1/2

E. Slump of the concrete shall be between 1-1/2 and 2-1/2 inches (40 to 65 mm) where machine methods are used for striking off and consolidating the concrete. If ENGINEER permits hand finishing, the slump may be increased to 3-1/2 inches (90 mm).

F. Ready-mixed concrete shall be in accordance with ASTM C94, Alternate 2, and shall yield a minimum compressive strength of 3,500 psi (24 Mpa) when cured in a moist room at a temperature within a range of 65 to 75 degrees Fahrenheit (18 to 24 Celsius) for a period of 28 days.

G. ENGINEER shall be provided with the mix design for review and approval, prior to the actual delivery of the concrete.

Part 3 Execution

3.01 Verification of Excavation and Forming

A. Prior to the installation of any concrete, examine the excavation and forms for the grades, lines, and levels required to receive the new Work. Ascertain that all excavation and compacted subgrades are adequate to receive the concrete to be installed.

B. Correct defects and deficiencies before proceeding with the Work.

3.02 Verification of Subgrade Conditions

A. Prior to the installing of any concrete, examine the subgrade to ascertain that it is adequate to receive the concrete to be installed. If the subgrade remains wet after all surface water has been removed ENGINEER may require the installation of edge drain.

3.03 Existing Improvements

A. Investigate and verify location of existing improvements, including structures, to which the new Work is to be connected. Make necessary adjustments in line and grade to align the new Work with the existing improvements after approval by ENGINEER.

3.04 Batch Plant

A. An adequate site for the batch plant shall be obtained by CONTRACTOR, at his expense. The site shall be maintained, and the plant operated in accordance with the conditions and requirements established by the community in which the plant is located.

3.05 Fine Grading

A. Subgrade shall be fine graded to the cross section shown on the Plans and shall be thoroughly compacted prior to the placing of forms or concrete.

3.06 Installation - General

A. The width, thickness, and type of concrete pavement shall be specified on the Plans or as approved by ENGINEER.

B. At street intersections, curb drops, conforming to the current rules and regulations of Act 8, Michigan PA 1973, shall be provided for the construction of sidewalk ramps. In addition, curb drops for sidewalk and driveway approaches shall be provided as specified in locations called for on the Plans or as approved by ENGINEER.

C. Construction operations shall be restricted to the existing right-of-way. If additional area is required, CONTRACTOR shall furnish ENGINEER with written permission from the property owner for any part of the operation he conducts outside the established right-of-way.

D. CONTRACTOR shall maintain traffic access at all intersections. Vehicle access shall also be maintained to all commercial and public properties and elsewhere as designated by ENGINEER.

3.07 Equipment Requirements

A. General:

1. Approved, mechanical concrete placing and finishing equipment shall be used for concrete paving except for gapped areas or where otherwise approved by ENGINEER.

2. CONTRACTOR shall furnish sufficient equipment for the placing of concrete pavement.

3. Equipment shall be on the job site and ready for normal operation before the paving operation is started.

4. Equipment shall be in good working order.

5. Equipment shall be subject to inspections and testing during construction.

6. Equipment shall be of sufficient capacity that the paver can operate continuously and obtain a rate of production that insures good workmanship and eliminates overloading of equipment or frequent interruptions or delays.

7. Equipment operating on or near the pavement shall be equipped with rubber-tired wheels.

B. Forms:

1. Except when paving with a slip-form paver, forms shall be used and shall be made of metal, having an approved section, which shall insure their rigidity under impact, thrust and weight of the heaviest machine carried on them.

   a. The thickness of the metal shall be not less than 1/4 of an inch (5 mm), except that a minimum thickness of 3/16 of an inch (4.5 mm) will be permitted if the form is a trapezoidal cross section.

2. Forms shall have a minimum length of ten (10) feet (3 m) and a depth not less than the edge thickness of the Work prescribed, except the subgrade may be a maximum of 1-inch (25 mm) lower than the bottom of the forms when so approved by ENGINEER.

a. The width of the base in direct bearing on the soil shall be not less than 0.75 of the form depth except that a width of less than eight (8) inches (200 mm) will not be permitted.

3. Each 10-foot (3 m) section of form shall have at least three (3) stake pockets. The forms shall be straight, free from distortion, and shall show no vertical variation greater than 1/8 of an inch (3 mm) in 10-foot lengths (3 m) from the true plane surface on the top of the form when tested with a 10-foot (3 m) straightedge and shall show no lateral variation greater than 1/4 of an inch (5 mm) from the true plane surface on the vertical face of the form when tested with a 10-foot (3 m) straightedge.

4. Approved wood or flexible forms and hand finishing will be required on all pavement where the radius for the edge of the pavement is less than 200 feet (60 m).

5. The method of connection between form sections shall be such that a locked joint is formed free from vertical movement in excess of 1/8 of an inch (3 mm) and from horizontal movement in excess of 1/4 of an inch (5 mm) under the impact, thrust and weight of the heaviest machine carried on the forms.

6. Sufficient forms shall be provided so that it will not be necessary to remove them in less than 12 hours, or longer if required, after the concrete has been placed.

C. Subgrade Roller or Compactor:

1. Equipment shall be self-propelled steel-wheeled or a pneumatic-tired roller weighing not less than eight (8) Tons (7 metric tons) or a self-propelled vibratory compactor of adequate size to compact the subgrade to the required density.

D. Subgrade Planer:

1. Steel-shod subgrade planer supported by two (2) flanged wheels resting on the side forms may be used for trimming the subgrade in small areas when approved by ENGINEER.

2. Steel-shod template shall be adjustable to fit the shape of the bottom of the pavement and shall have adequate connection to a rigid frame to maintain the crown.

3. Planer shall be of sufficient weight to plane off all high spots encountered.

E. Base Trimmer:

1. For slip-form construction, a powered, self-propelled base trimmer will be required. This base trimmer shall be capable of trimming the base to the required cross section.

F. Water Supply Equipment:

1. Pumps and pipe lines shall be such capacity and nature as to insure an ample supply and adequate pressure of water, simultaneously, for all the requirements of machinery, mixing, sprinkling subgrade, and other requirements of the Work.

2. Water may be supplied in tank wagons to augment inadequate pipe lines or to replace them entirely if a sufficient number of units are employed.

G. Finishing Machine:

1. Finishing machine shall be power driven and of an approved type which will strike off and compact the concrete with a screeding and troweling action.

   a. Machine shall be capable of finishing the concrete in the manner specified herein, and shall provide a minimum of two (2) oscillating screeds.

2. A combination concrete spreader/finishing machine (i.e.: Pav-Saver®) may be used for residential streets not exceeding 100-feet (305 m) in length and 18-feet (3.7 m) in width or when approve by ENGINEER.

   a. The combination type machine must have suitable automatic vibrators, strike-off bars, augers, screeds, finishing pan, etc., in accordance with the requirements of this section, to produce a densely compacted, homogeneous concrete slab, true to line, grade and cross section.

H. Concrete Spreader:

1. An approved concrete spreader with a strike-off board or a separate strike-off shall be used to level each layer of concrete, before placing of reinforcement, and before finishing the concrete.

   a. It shall have sufficient weight and rigidity to retain its shape under working conditions to properly strike off the concrete.

   b. Two separate spreaders are not required where an approved mesh depresser type machine is used.

2. A concrete spreader is not required for the construction of residential street concrete pavement when approved by ENGINEER.

I. Vibratory Screed:

1. An approved hand-propelled vibratory screed shall be provided for use in gapped areas at driveways and intersections, and where machine methods are not feasible to screed and consolidate the concrete.

   a. Gaps finished by this method shall be limited to one (1) joint spacing in length and one (1) single lane width.

2. Screed shall consist of a steel-shod strike board having a minimum thickness of two (2) inches (50 mm) and equipped with a gasoline engine capable of producing at least 5,000 vibrations per minute.

   a. Other vibratory screeds may be approved by ENGINEER.

J. Membrane Sprayer:

1. A mechanically-pumped pressure sprayer capable of applying a continuous uniform film of curing compound will be required.

2. Equipment shall provide adequate stirring of the compound during application.

K. Slip-Form Paving Equipment:

1. When pavement is placed by the slip-form method, the slip-form paving equipment shall spread, consolidate, screed, and mechanically float the freshly-placed concrete in such a manner that only a minimum of hand finishing will be necessary to provide a dense and homogeneous pavement.

2. The machine shall be equipped to vibrate the concrete for the full width and depth of the pavement being placed.

L. Floats:

1. Mechanical float shall be a combination float finisher. Where a mechanical float is an integral part of a slip-form paver, a separate mechanical float will not be required.

2. A float finisher shall consist of a machine having two (2) screeds and be equipped with a suspended pan float. The second screed and the pan float shall be suspended in such a manner that they operate independently of the side forms.

3. A mechanical float will not be required for the construction of residential street concrete pavement.

M. Footbridge:

1. A movable bridge shall be provided when necessary to satisfactorily finish the pavement or construct joints. The bridge shall be designed and constructed so that it will not come in contact with the concrete.

N. Transverse Float:

1. This float shall be made of metal and shall be at least ten (10) feet (3 m) in length and of the box or channel type with a floating face at least six (6) inches (150 mm) in width. It shall be constructed so as to be light in weight, rigid and free from warps.

O. Vibrator:

1. Vibrator for consolidating the concrete along the faces of the forms and adjacent to joints shall be an approved electric or mechanical vibrator of an internal type, not less than two (2) inches (50 mm) in diameter.

2. It shall have minimum frequency of 5,000 vibrations per minute for a tube two (2) inches (50 mm) in diameter, 3,600 vibrations per minute for a tube four (4) inches (100 mm) in diameter, or a proportionate frequency for an intermediate size.

3. At least two (2) vibrators shall be provided for each concrete paving unit on the project.

4. Vibrators used adjacent to the forms in conventional paving shall be connected with the equipment on which they are mounted such that vibration of the concrete will start automatically with the forward movement of the equipment and stop automatically whenever forward movement stops.

P. Form Tamper:

1. A mechanical form tamper of approved design will be required on all projects. It shall be capable of thoroughly and uniformly compacting the soil under the forms.

Q. Strike-Off for Reinforcement:

1. An approved strike-off shall be used to level the concrete before placing the pavement reinforcement.

2. It shall be adjustable and shall be supported by two (2) flanged wheels on each end which rest on the side forms.

3. It shall have sufficient weight and rigidity to retain its shape under working conditions and properly strike off the concrete.

4. An approved hand strike-off resting on the forms shall be used for irregular areas.

5. The strike-off may be a part of the concrete spreader or a finishing machine.

R. Lane Tie Bar Installer:

1. When not placed on approved chairs, lane tie bars shall be installed by use of an approved mechanical device.

S. Reinforcement Carrier:

1. Reinforcement not placed on chairs shall be transferred from the hauling equipment to a movable bridge which spans the pavement being cast or placed by other approved means which will not result in contamination of the concrete.

2. Bridge shall be capable of carrying the reinforcement load without appreciably deflecting the forms.

T. Joint Filling and Sealing Equipment:

1. Equipment for filling and sealing joints shall be available for inspection and testing at least 48 hours prior to its use.

2. Heating kettle for hot poured sealing material shall be of the indirect-heating or double boiler type, using oil as the heat transfer medium. It shall have a thermostatically controlled heat source, a built-in automatic agitator, and thermometers installed to indicate both the temperature of the melted sealing material and that of the oil bath.

a. CONTRACTOR shall demonstrate that the equipment proposed for use will consistently produce a joint sealer of proper pouring consistency.

3. Hot-poured sealing material shall be applied directly from the heating kettle; the kettle shall be equipped with a pressure pump, hose and nozzle suitable for forcing the sealing material to the bottom of the joint and completely filling the joint.

   a. The rate of application shall be controlled so as to completely fill the joint and not spill the material on the surface of the pavement.

   b. The hose and nozzle shall maintain the temperature of the sealing materials so that the loss in temperature is not over 10 degrees Fahrenheit (12° Celsius) between the nozzle and the heating tank.

   c. Heat from a direct flame on the nozzle shall not be used to maintain the proper temperature of the sealing material.

   d. Eeating equipment shall be mounted on rubber-tired wheels, and only rubber-tired equipment shall be used to move the heating equipment on the pavement.

4. Cold applied sealing compound shall be applied by means of pressure equipment that will force the material to the bottom of the joint and completely fill the joint without overflowing onto the surface of the pavement.

5. Sealing machine shall include a mechanical mixer capable of mixing the sealing components into a uniform, homogeneous mass.

U. Preformed Neoprene Joint Sealing Equipment:

1. Equipment for applying the lubricant and installing the preformed joint seal may be either power or hand operated equipment suitable for installing the joint seal as recommended by the manufacturer.

V. Sandblasting Equipment or Power Wire Brush:

1. Sandblasting equipment shall be of proper size and capacity to obtain the cleaning specified and shall operate at a nozzle pressure adequate for the performance of the Work. Nozzles shall be of proper diameter in relation to the width of joint and shall be replaced as necessary due to enlargement by wear.

2. A power wire brush may be used in place of sandblasting equipment.

W. Air Compressors:

1. Air compressors shall be portable and capable of furnishing sufficient air to maintain a nozzle pressure adequate to remove all loose fragments of concrete and foreign material from the joints.

2. Suitable traps shall be employed to maintain the compressed air free of oil and moisture.

X. Power Broom:

1. A mechanical broom with pickup suitable for cleaning the pavement will be required.

Y. Concrete Saw:

1. Two (2) self-propelled concrete saws which are adequately powered to cut hardened concrete to a minimum depth as shown on the Plans will be required.

2. Minimum thickness of the saw blade shall be 3/16 of an inch (5 mm). Saws shall be equipped with suitable guards.

Z. Miscellaneous Equipment**:**

1. Small tools to completely and satisfactorily finish the Work, including straightedges for testing pavement and forms, shall be provided by CONTRACTOR.

3.08 Placement of Forms

A. Forms shall be placed and checked for line and grade at least 500 feet (150 m) in advance of placing concrete.

B. Forms shall be adequately staked and braced to resist the pressure of concrete and the thrust of the equipment.

C. Forms shall have uniform bearing on the subgrade throughout their entire length and width.

D. After setting the forms to grade, thoroughly tamp both the inside and outside with an approved mechanical form tamper.

E. Forms shall be thoroughly cleaned before they are placed.

F. Forms shall be neatly and tightly joined, and shall be securely staked by at least three (3) stakes per form.

G. Forms shall be oiled before concrete is placed against them.

H. Forms shall be checked for line and grade, after being set.

I. Forms showing a variance from the staked line by more than 1/4 inch (5 mm) or from the staked grade by more than 1/8 inch (3 mm) in ten (10) feet (3 m) shall be adjusted.

J. Where the use of flexible forms are required, sufficient back bracing shall be provided to prevent undue deflection of the forms during placement of the concrete.

3.09 Placing Concrete

A. Placing of concrete should not commence or continue until the condition of the subgrade has been approved by ENGINEER.

B. Concrete shall be spread or distributed as soon as placed. If a mechanical spreader is not used, the concrete shall be deposited in a manner that requires a minimum of re-handling to avoid segregation and separation of materials. Concrete shall be deposited to a height sufficiently above grade so that when consolidated and finished it shall conform to the required finished grades.

C. Concrete along the faces of forms and adjacent to joints shall be consolidated and compacted to fill all voids.

D. Forms shall not be vibrated to consolidate the concrete.

E. When the pavement is placed in two (2) layers, the first layer may be cast three (3) to six (6) inches (75 to 150 mm) narrower on each side than the proposed pavement slab, so that the full depth of pavement, at the edges, will be cast with the second layer. Equipment shall vibrate concrete placed full depth for the complete width and depth of the pavement being placed. For concrete placed in two (2) layers, only the second layer will be required to be vibrated.

F. Placing of concrete shall be continuous as much as possible between transverse joints.

G. Whenever a temporary halt in operation occurs, the concrete and unfinished end of the slab shall be covered with wet burlap or plastic.

H. If the interruption of Work continues for more than 20 minutes, a construction joint shall be placed, provided the proposed construction joint is 15 feet (4.5 m) or more from the last joint for reinforced pavement and at last ten (10) feet (3 m) or more from the last joint in plain concrete pavement. Sections of pavement shorter in lengths will not be permitted and, if constructed, shall be removed and replaced at CONTRACTOR's expense.

I. Integral curbs, where specified or required, shall be constructed monolithic with the pavement slab. Curb material shall be placed before the pavement has started its initial set and shall be of the same mix as the concrete pavement.

J. Base and back forms will be required when constructing straight curbs, and back forms with templates of the required curb shape shall be used when constructing rolled and mountable curbs. Curb concrete shall be spaded sufficiently to eliminate all voids and tamped to bring the mortar to the surface, after which the curb shall be given a final finish to match the texture of the pavement.

K. After removing forms, any visible areas of honeycomb or minor defects shall be immediately filled with mortar, having one part of Portland cement and two parts fine aggregate, and shall be applied with a wooden float.

L. Where adjacent pavement lanes are constructed in separate pours, no equipment shall be operated upon recently placed concrete until the pavement has attained at least 85% of the design strength as determined by testing cores taken from the project, or until the pavement is 14 days old, at the option of ENGINEER.

M. Equipment wheels operating on the pavement, shall operate at least one foot (300 mm) from the edge of the pavement. Equipment wheels shall be rubber-tired.

N. The paver shall not be permitted on the new slab until the pavement has attained full design strength. The paver shall not operate on any new slab without using wood mats having an approved thickness and width to insure that the pavement will not be marked or structurally damaged.

O. Pavers are not permitted to operate on residential streets.

P. If the curing compound is damaged, it shall be repaired by spraying additional curing compound on the damaged areas as soon as the Work is completed.

Q. The filler strip on pavement widening projects shall be poured as soon as possible but not later than the first working day following the placing of the slab.

R. At intersections and where access is required to property along the Project, construction shall be completed by gapping the proposed pavement. Load transfer, contraction, of end-of-pour joint devices shall be placed at the gapped ends of the pavement.

S. In lieu of pavement gapping, CONTRACTOR may elect to place a temporary bridge, of a design approved by ENGINEER, to provide access. Furnishing, placing, maintaining, and removing the bridge shall be at CONTRACTOR's expense.

3.10 Placing Pavement Reinforcing

A. Where reinforcement is required, the sheets or mats shall be placed at the depth below the surface of the finished pavement, as shown on the Plans.

B. Pavement reinforcement shall be shipped and delivered to the Work in flat sheets or mats.

C. Adjacent sheets or mats shall be lapped, as indicated on the Plans, and shall be fastened to each other in no less than two (2) places in each pavement lane.

D. Where the width of pavement varies, the reinforcement requirements shall be the same as called for on the Plans. Split sheets or mats may be used to conform to the particular pavement configuration. Side laps shall not be less than the spacing of the longitudinal wires or bars.

E. On widening Projects where the pavement slab is less than six (6) feet (1.8 m) in width, 1/2 inch (10 mm) diameter longitudinal reinforcing bars may be substituted for standard reinforcement, providing the bars are spaced not more than 12 inches (300 mm) center-to-center. The first bar shall be not more than three (3) inches (75 mm) from the edges of the widened slab, and the bars shall be lapped a minimum of 12 inches (300 mm).

F. Reinforcement shall be installed by one of the following methods:

1. Chairs upon which reinforcement is to be mounted shall support the reinforcement and shall have such bearing on the base that there will be no undue penetration of the base. Maximum spacing of the chairs shall be sufficient to maintain the reinforcement at the specified depth. The reinforcement shall be placed directly from the hauling unit unto the chairs.

2. When reinforcement is placed between two (2) layers of concrete, the first layer shall be mechanically spread and struck off to the required depth below the proposed finished surface. Reinforcement shall be placed directly from the carrier onto the struck off concrete.

3. Any area where the use of the mechanical spreader or mechanical strike-off is not feasible, the reinforcement shall be mounted on chairs.

3.11 Joints

A. General:

1. Longitudinal and transverse joints shall conform to the details and shall be constructed at the locations shown on the Plans or as directed by ENGINEER.

2. Joints shall be constructed true to line with their faces perpendicular to the surface of the pavement.

3. Transverse joints shall be constructed at right angles to the centerline of the pavement, unless otherwise called for on the Plans or as determined by ENGINEER. Joints shall not vary more than 1/4 of an inch (5 mm) from a true line.

4. The surface of the pavement adjacent to all joints shall be finished to a true surface. Where indicated on the Plans, joints shall be edged to the radius shown or a minimum 1/4 inch (5 mm) radius. Surface across the joints shall be tested with a ten (10) foot (3 m) straightedge as the joints are finished and any irregularities shall be corrected before the concrete has hardened.

5. When pavement is laid in partial width slabs, transverse joints in the succeeding slabs shall be placed in line with the like joints of the first slab. In the case of widening existing pavements, transverse joints shall be placed as shown on the Plans, or as directed by ENGINEER.

6. Keyways, where required, shall be accurately formed with templates of metal, wood, or paper securely pinned in place. The gauge or thickness of the material in the templates shall be such that the full keyway, as specified, is formed in the correct location.

B. Longitudinal Joints:

1. General:

a. Longitudinal joints shall be sawed, longitudinal lane tie joint with tie bars or bulkhead construction joints with hook bolts.

b. Where called for on the Plans a keyway shall be constructed in the bulkhead construction joint.

2. Longitudinal Lane Tie Joint (D):

a. Longitudinal lane tie joints with tie bars shall be planes of weakness formed by sawing a groove in the hardened concrete according to the alignment, width and depth shown on the Plans.

b. Tie bars of the type, diameter and length called for on the Plans, shall be placed at the required depth parallel to the finished surface, at right angles to the joint and at the uniform spacing also called for on the Plans or as approved by ENGINEER.

c. Bar chairs shall be used to support the lane tie bars or the lane tie bars may be installed by use of a mechanical device, approved by ENGINEER. The placing of lane tie bars in the concrete by hand methods will not be permitted.

d. The joint shall be sawed as soon as the concrete will not spall or not more than three (3) days after placement, and shall be completed before traffic of any kind uses the pavement. Immediately following the sawing of the joint, the slurry resulting from the sawing operation shall be completely removed from the joint, and the immediate area by flushing with a jet of water under pressure.

e. The joint shall be blown out with a jet of compressed air to remove the flushing water. After the joint is dry it shall be cleaned out with a jet of compressed air with a working pressure of at least 90 psi (620 kPa) and then shall be sealed in accordance with Article 3.18, with an application of an approved hot or cold applied type joint sealing compound. The sealing compound shall be applied with approved pressure type equipment with the nozzle extending into the groove and the groove shall be filled until the sealer overlaps the pavement about 1/8 of an inch (3 mm).

3. Longitudinal Bulkhead Construction Joint (D):

a. Longitudinal bulkhead construction joints with hook bolts shall be used in part-width construction of concrete pavement and elsewhere as shown on the Plans, or as approved by ENGINEER. The size, spacing, and depth of the hook bolts below the surface of the pavement shall be as shown on the Plans.

b. For slip-form paving, lane ties of an approved type may be substituted for hook bolts and shall be spaced at 30-inch (750 mm) centers, unless otherwise indicated on the Plans. Lane ties for slip-form paving shall be placed in the concrete with a pneumatic powered installer or equipment producing equal results. Lane ties, which are not set with adequate consolidation of the concrete or are not within 30 degrees of being perpendicular to the pavement edge in a horizontal plane, shall be replaced with drilled-in expansion-anchored lane ties.

c. Where a bulkhead joint is to be constructed, hook bolts and couplings shall be attached to the forms and shall be held in position during the placing and finishing of the concrete so as to permit the removal of the pavement forms without damage to the concrete or hook bolt assembly. The ends of the couplings shall be protected so that the concrete, dirt or other materials cannot enter the couplings and prevent a satisfactory connection with either hook bolt.

d. Where hook bolts or lane ties are installed for use in future pavement widening, in curb or curb and gutter construction, a rust preventive oil shall be inserted into the open end of the couplings immediately after removal of the pavement forms by means of a hand operated pump in sufficient quantity to completely cover the internal threads. After application of the protective oil, neoprene or plastic plugs shall be inserted into the ends of the couplings to completely seal the opening without protruding outside of the couplings more than 3/8 inch (9 mm).

e. Concrete shall be edged with a tool having the radius of curvature and depth of lip shown on the Plans. The second pour of concrete shall be edged with a longer lipped edging tool than that used on the first concrete pour.

f. After the concrete has cured for the required time, all extraneous material shall be removed from the joint and the joint then sealed with an approved hot-poured or cold-applied elastic-type compound. The use of sandblasters and a jet of compressed air will be required to clean the joint before sealing.

C. Transverse Joints:

1. General:

a. Transverse joints shall be contraction joints, plane of weakness joints, dummy joints, expansion joints, construction joints, end-of-pour joints and pressure relief joints.

2. Contraction Joints (C):

a. Contraction joints shall consist of a load transfer unit and a joint groove formed by sawing. Contraction joints shall be constructed as indicated on the Plans and shall be spaced a maximum of every 57'-3" (17.5 m) or as provided for elsewhere.

b. The load transfer unit shall be epoxy coated dowel bars, spaced and arranged in the positions indicated on the Plans, accurately held in place by an approved metal device so as to be perpendicular to the plane of the cross section of the pavement and parallel to the centerline at a distance from the surface equal to 1/2 the thickness of the slab.

c. This device shall consist of connected transverse and longitudinal members arranged to hold each dowel so firmly that its final position after concreting operations shall not vary more than 1/8 of an inch per foot of length (3 mm per meter) from its designated line and grade. The device shall be such as will permit the joint to be completely assembled alongside the Work, and it shall be sufficiently rigid so that the joint can be lifted into place on the subgrade as a unit.

d. One end of each dowel bar shall be free to move in the slab as the concrete contracts and expands. To accomplish this, 2/3 the length of each dowel shall be thoroughly lubricated with liquid asphalt. The liquid asphalt coating shall be applied to a sawed end of the dowel bar or, in the case of dowel bars with sheared ends, a metal cap shall be placed on the coated end of the dowel bar. The asphalt coating shall be sufficiently dry before using the dowels so that it will not be removed by handling and placing the dowels in the joint. The bars shall be installed so that the alternate bar on each side of the joint shall be the coated end of the bar.

3. Plane of Weakness Joints (WT):

a. Plane of Weakness joints shall be placed in plain concrete pavements only and is to be constructed immediately after the finishing operation has been completed. A groove shall be formed in the plastic concrete with a metal forming bar to the depth indicated on the Plans. A premolded bituminous filler strip shall be placed in the groove formed by the metal bar, from a bridge operating on the pavement forms. The concrete shall then be floated against the sides of the filler, and the joint edged to a 1/8 inch (3 mm) radius.

4. Plane of Weakness Joint for Concrete Base Course (WTB):

a. Dummy joints shall be placed in reinforced concrete pavements only where called for on the Plans. It shall be constructed immediately after the finishing operation has been completed by forming a groove in the plastic concrete with a metal forming strip into which expanded polystyrene or other approved temporary filler is placed. The material shall be installed flush with the surface of the pavement and the area on both sides of the joint shall be finished. Transverse joints with a temporary filler shall not be edged. The pavement reinforcement shall be continuous through this joint.

5. Expansion Joints (E) and (E_1):

a. Expansion joints (E_1) shall consist of a load transfer unit and a premolded fiber filler and shall be used on reinforced concrete pavements or where shown on the plans.

b. Expansion joints (E) shall consist of a premolded fiber filler without the load transfer unit and shall be used for joints in concrete capping, end connections with structures or existing pavements, plain concrete pavements, and other places where shown on the Plans where installation of the load transfer unit is not feasible as approved by ENGINEER.

c. The load transfer units shall be assembled and the epoxy coated bars lubricated with liquid asphalt. Liquid-asphalt-coated end of each bar shall be provided with a close fitting metal cap.

d. The fiber filler shall extend the full depth and width of the joint. After installation, the top shall be not less than 1/2 inch (10 mm) and no more than 1-inch (25 mm) below the finished surface. It shall be furnished in lengths not less than the lane widths being poured. Where additional partial lengths are necessary, the minimum length of load transfer unit and premolded fiber filler shall be sufficient to span two (2) dowel bar spacings. Where more than one (1) section is allowed and used in a joint, the sections shall be securely joined together.

e. Expansion joints in curb lanes with integral curb, the fiber filler used in the pavement shall extend completely through the curb section. The fiber filler placed in the curb above the slab shall be 1-inch (25 mm) in width.

f. During installation, the joint shall be held in place by an approved installing device which shall be securely staked. The top edge of the filler shall be protected, while the concrete is being placed, by a metal channel cap of at least 10-gage material having flanges not less than 1-1/2 inches (40 mm) in depth. The channel cap shall be shaped to the proposed crown of the pavement and shall extend over the full length of the filler.

6. Pressure Relief Joints (PR):

a. The method of constructing a pressure relief joint shall be as indicated on the Plans.

b. Pressure relief joint material shall be a flexible, low-density, expanded, extruded polyethylene plank. Joint material shall be cut off to 1/2 inch (10 mm) below the top of the pavement surface and shall extend entirely through and to within 1/2 inch (10 mm) of the face and top of the curb.

7. End of Pour Joints and Construction Joints:

a. End of pour joints in reinforced pavement shall be formed by placing a bulkhead and installing a load transfer device, as specified for contraction joints, except that the ends of the dowel bars shall not be lubricated. The load transfer device shall be so installed that each dowel bar will be embedded in the concrete for 1/2 of its length.

b. When the next pour is made, a space for hot-poured rubber joint filler shall be provided by placing temporary filler in the fresh concrete. End-of-pour joints shall be constructed using 2-piece dowels and a bulkhead and shall be placed where it is anticipated that three (3) days or more will elapse between the casting of adjacent pours.

c. Construction and end-of-pour joints shall be sealed as specified for transverse contraction joints.

d. End of pour joints in plain concrete pavements shall be formed by placing a bulkhead, fiber keyway, and installing 1/2 inch (10 mm) diameter deformed bars, 30 inches (75 mm) in length, at 18-inch (450 mm) intervals across the end of the pavement.

e. The pavement across the end of both slabs shall be thickened and the joint shall be edged and sealed.

8. Transverse joints in a concrete pavement shall extend entirely through the integral curb. The material used to construct the joint in the curb shall be of the same kind as provided for the pavement.

9. Bituminous fiber filler shall be used to construct the expansion joints in the integral curb of reinforced concrete pavements. The thickness of the fiber filler material in the curb above the gutter shall be 1-inch (25 mm). Joint material shall be precut so as to conform to the geometric shape and cross-sectional area of the curb, and shall be placed in intimate contact with the filler material in the pavement.

10. The edges of transverse joints in the integral curb shall be rounded with an approved finishing tool, having a radius of 1/4 inch (5 mm).

3.12 Consolidating and Finishing

A. The sequence of operations after the placing of concrete shall be: striking off and consolidating, floating, straightedging and finishing with burlap drag, edging and final finishing with burlap drag.

B. Mechanical methods shall be employed to strike off and consolidate or compact the concrete, except in gapped areas or where the pavement width will not permit the use of machine methods. Gaps less than one (1) joint opening in length may be finished by hand methods, provided they are finished in single-lane widths.

C. Strike off, consolidate and compact the concrete to such an elevation that when all finishing operations are completed, the surface will conform to the required finished grade and cross section. At least four (4) inches (100 mm) of concrete above the finished pavement grade shall be maintained ahead of the screed for its entire length. In consolidating the surface of the pavement, on residential street construction when a single screed finishing machine is used, it shall operate over each section of the pavement twice. Only sufficient mortar shall be worked to the surface to provide a dense smooth finish. Excessive operation of the machine over a given area will not be permitted. Segregated particles of coarse aggregate which may collect in front of the screed shall be thoroughly mixed by hand with the mass of concrete already on the subgrade.

D. If it is not possible to use mechanical equipment on irregular areas, an approved, self-propelled vibratory screed shall be employed to strike off and properly consolidate the concrete surface to the required finish grade. Where it is not possible to use a vibratory screed, a hand strike board of an approved design, will be permitted. The entire area of the pavement shall be consolidated to insure an absence of voids.

E. Strike-off boards shall be moved forward with a combined longitudinal and transverse motion, with neither end raised from the side forms during the process. A slight amount of excess concrete shall be kept in front of the front edge at all times. When striking off and consolidating by hand, pours will be limited to single lanes or 1/4 of intersections.

F. After striking off and consolidating, the surface shall be made uniform by longitudinal or transverse floating by a mechanical method unless the pavement is permitted to be constructed in single lane widths.

G. Where mechanical floating is an integral part of the operation of a slip-form paver, separate mechanical floating methods will not be required.

H. Mechanical longitudinal floating will not be required for residential street construction.

I. When mechanical equipment is not used for floating, a transverse float at least ten (10) feet (3 m) in length shall be operated across the pavement by starting at the edge and slowly moving to the center and back again to the edge. The float shall then be moved ahead 1/2 of its length and the operation repeated.

J. Care shall be taken to preserve the crown and cross section of the pavement. Float finishing operation shall not proceed until the concrete has attained a consistency so that no excess concrete is carried ahead of the float but the entire surface can be floated and sealed.

K. Immediately following the float finishes and while the concrete is still plastic, CONTRACTOR shall test the slab surface for trueness by means of a 10-foot (3 m) straightedge or acceptable float.

L. The straightedge shall be placed at the center of the slab with the blade parallel to the centerline and pulled slowly and uniformly to the edge. This operation shall be repeated until the surface of the concrete is free from irregularities and makes contact at all points with the bottom of the straightedge. The straightedge shall then be moved forward 1/2 its length and the operations repeated.

M. Depressions found in the surface shall be filled with fresh concrete and consolidated by floating with a long-handled float not less than ten (10) feet (3 m) in length. Float may also be used to smooth sections of the surface that may have become rough or torn by dragging with the straightedge.

N. For pavement constructed by the slip-form method, the edge settlement shall be determined as soon as practical after paving operations begin. Edge settlement in excess of 3/8 inch (9 mm) shall be corrected before the concrete has hardened. When edge settlements in excess of 1/4 inch (5 mm) persist, paving shall be suspended and operational corrections made before ENGINEER will permit the resumption of paving. If CONTRACTOR consistently fails to construct pavement within these tolerances, the use of slip-form methods shall be discontinued and pavement placed by means of conventional forms. When paving is accomplished by the slip-form paving method, all mortar paste shall be wiped from the sides of the slab.

O. The surface shall then be tested for smoothness with the straightedge. During this operation, the contact of the straightedge with the concrete shall be uniform over the entire length tested. At the time of testing, the surface shall be free from soft mortar or excessive water. The testing straightedge shall be used for this purpose only.

P. Where the float finisher method is not utilized, as soon as the hand floating is completed, all laitance, surplus water, and inert material shall be worked entirely off the pavement and the surface made smooth by dragging with a rigid straightedge ten (10) feet (3 m) in length and the surface shall be tested.

Q. As soon as all excessive moisture has disappeared and while it is still possible to produce a uniform surface of gritty texture, the pavement shall be finished by dragging a seamless strip of damp burlap or cotton fabric, not less than five (5) feet (1.5 m) nor more than six (6) feet (1.8 m) in width, over the full width of the pavement. Burlap or cotton drag shall be pulled by a bridge supported on a pavement forms. Fabric shall be renewed as often as necessary to obtain the required texture.

R. Immediately after the initial finishing with burlap, the edges of the slab and all specified joints shall be finished with an edging tool to the radii indicated on the Plans. Pavement shall then be given a final finish by dragging the damp burlap or cotton fabric over that portion of the pavement disturbed by the edging operation.

3.13 Surface Requirements

A. High spots in the surface, exceeding 1/8 inch (3 mm) from the straightedge but not more than 1/2 inch in ten (10) feet (10 mm in 3 m) shall be removed or reduced by rubbing with a carborundum brick and water until contact with coarse aggregate is made.

1. If contact with coarse aggregate is made before reaching an acceptable tolerance, such high spots shall be removed by an approved surface-grinding machine before acceptance of the pavement.

B. High spots in excess of 1/2 inch in ten (10) feet (10 mm in 3 m) will be evaluated by ENGINEER and if the Work is rejected, it shall be removed and replaced at CONTRACTOR's expense. CONTRACTOR shall take immediate steps to eliminate the cause of the defective surface.

3.14 Curing

A. After the finishing operations have been completed and immediately after the free water has left the surface, the surface of the slab shall be completely coated and sealed with a uniform layer of white membrane curing compound.

B. Compound shall be applied in a continuous uniform film by means of mechanically pumped pressure sprayer equipment at a rate of one (1) gallon per 200 square feet (4 L per 20 m^2) of surface. Curing compound shall not be thinned. The equipment shall provide adequate stirring of the compound during application. Equipment for applying the compound must be on the Project and approved by ENGINEER before Work is started.

C. Hand-spray equipment will be permitted only for the application of the curing compound over the sides of the slab, and for any minor damaged areas. If rain falls on the newly coated pavement before the film has dried sufficiently to resist damage, or if the film is damaged in any other way, CONTRACTOR will be required to apply a new coat of material to the affected areas. The treated surface shall be protected by CONTRACTOR from injury for a period of at least seven (7) days. Traffic, either foot or otherwise, will be considered as injurious to the film of the applied compound. A minimum of foot traffic will be permitted on the dried film as necessary to properly carry on the Work including the removal of any high spots, provided any damage to the film is immediately repaired by the application of a second coat of the compound.

D. Immediately after the forms are removed, the entire area of the side of the slab shall be coated with the curing compound at the rate specified for the pavement surfacing.

E. CONTRACTOR shall provide on the Project sufficient burlap or polyethylene coverings for the protection of the pavement in case of rain or breakdown of the spray equipment. Failure to provide proper curing will be considered as sufficient cause for immediate suspension of the concreting operations.

3.15 Removal of Forms

A. Forms may be removed from freshly placed concrete after it has set for 12 hours, provided it can be done without damage to the pavement or curb edge. If during form removal the pavement or curb edge is being damaged, the form removal shall cease until the concrete has attained greater strength. The period of time for removing forms may be increased or decreased when approved by ENGINEER.

B. Immediately after removal of the forms, the ends of all joints shall be cleaned, and any visible areas of honeycomb or minor defects shall be filled with mortar, composed of 1-part Portland cement and two (2) parts fine aggregate from the same source as used in the pavement, applied with a wooden float. Immediate steps shall be taken by CONTRACTOR to correct the conditions contributing to these defects. The sides of the pavement shall be sprayed with curing compound immediately upon removal of the forms, except where honeycombed areas are to be pointed, and them immediately cured.

C. Forms and pins shall not be placed on new pavement that is being cured with membrane.

3.16 Sawing Joints

A. General:

1. Contraction joints, longitudinal lane-tie joints with tie bars, and end of pour joints shall be sawed.

2. Joints shall be sawed before any traffic is permitted on the pavement. The concrete saw will be permitted on the pavement to saw the joints, but the water supply truck will not be permitted on the pavement until the compressive strength is not less than 3,000 psi (21 MPa). When permitted on the pavement, the water supply truck must be kept a minimum of 50 feet (15 m) behind the sawing operation. At least two (2) approved concrete saws shall be available for use at all times, and one saw shall be capable of sawing a joint groove 2-1/2 inches (65 mm) deep.

3. The saw cut for transverse end-of-pour joints shall be made to receive the joint sealing material.

4. Longitudinal lane-tie joints with the tie bars shall be sawed in accordance with the alignment and dimensions indicated on the Plans.

5. For joints formed in one operation, the joint groove shall be sawed before any transverse cracks develop. Raveling or spalling along the joint shall be repaired as specified in Article 3.17 of this Section.

B. Transverse contraction joints shall be sawed in two stages:

1. Stage 1 Sawing:

a. The first stage shall be a relief cut directly over the center of the load transfer assembly. The initial relief cut shall be made as soon as the saw can be placed on the freshly poured concrete, and the sawing shall continue as long as the pavement can support the saw without making or appreciably raveling of the joint.

b. When water is not used in the sawing operation, membrane curing compound shall be applied immediately.

c. When water is used in the sawing operation, the slurry resulting from the sawing operation shall be completely removed from the cut and from the immediate area by flushing with a jet of water. Additional membrane curing compound shall be applied within 12 hours after the relief cut has been made.

C. Stage 2 Sawing:

1. Second stage sawing of joints shall not start until the concrete has cured for a minimum of 48 hours. The joint groove shall be centered over the relief cut and sawed to the specified dimensions shown on the Plans plus any increase in width of the relief cut due to shrinkage or contraction. The groove width tolerance shall be ± 1/16 inch (2 mm).

2. Joints sawed without the use of water shall be blown clean of all foreign material by a jet of compressed air.

3. If water was used in the sawing operation, the slurry resulting from the sawing operation shall be completely removed from the groove and the immediate area by flushing with a jet of water and then blown dry with compressed air.

4. Transverse joint grooves shall receive a final cleaning with a jet of compressed air adequate to remove all foreign material, just prior to permanent sealing.

5. If the specified seal is not installed within seven days of final sawing, the joint groove shall be temporarily sealed with a suitable material or device to prevent the infiltration of foreign material.

6. Traffic shall not be permitted over the full width joint grooves prior to the installation of either the permanent seal or temporary seal.

3.17 Patching Joints

A. General:

1. After the joints have been sawed and cleaned, they shall be inspected for spalls and voids.

2. Loose, unsound or damaged concrete shall be removed to the satisfaction of ENGINEER.

3. Spalls and voids will be classified as minor, intermediate or major spalls and shall be repaired accordingly.

B. Minor Spalls:

1. Spalls or voids which have increased the specified size of the joint groove beyond any of the following limits, but less than 36 square inches (250 cm^2), shall be repaired by patching with an approved epoxy mortar before the seal is installed.

2. Spalls which extend more than 1/4 inch (5 mm) from the joint face and over 1/2 inch (10 mm) below the surface of the pavement.

3. Spalls which extend more than 1/4 inch (5 mm) from the joint face and two (2) inches (50 mm) or more in length, regardless of the depth of spall below the surface of the pavement. Void areas larger than 1/2 inch (10 mm) in diameter in the upper 1-inch (25 mm) of the joint face or larger than 1-inch (25 mm) in diameter regardless of location.

4. Spalled concrete surface shall be thoroughly cleaned by sandblasting, power-wire brushing, or hand-wire brushing. The patch area shall then be blown clean with a jet of compressed air. A heavy polyethylene sheet or a rigid material shall be inserted into the joint groove and held tightly against the joint face that is to be patched.

5. Concrete shall be clean and dry when the epoxy resin mortar is placed. The surface shall be made free of frost by heating with a clean source of heat, approved by ENGINEER, until dry. Care shall be taken not to damage the concrete by heating.

6. Epoxy binder will be a mixture of two (2) parts epoxy resin to one (1) part curing agent by volume, or as approved by ENGINEER.

7. Epoxy resin compound shall be mixed in a clean metal or polyethylene container with approved stirrer operating at 250 to 500 rpm. While the epoxy resin is being mixed, the curing agent compound shall be gradually added. The mixture shall then be stirred for a minimum of three (3) minutes until it is uniform.

8. After the epoxy binder is thoroughly mixed, a small portion shall be reserved for priming. The dry 2MS sand shall be uniformly blended into the balance of the mixture to give an epoxy mortar of stiff or trowellable consistency. One part of mixed binder to about 3.5 parts of dry sand, by volume, will usually give a workable mix.

9. Spalled surface shall be primed with the freshly mixed epoxy binder scrubbed into the surface with a suitable applicator to insure complete wetting and coverage of all areas to which the epoxy mortar must bond.

10. Immediately after priming, the epoxy mortar shall be placed in the spalled area and finished to the shape of the original pavement surface. If the bond coat is not tacky when the mortar is placed, a second application shall be made. The edge of the patch shall conform with the rest of the joint groove. Dry 2NS sand shall be sprinkled onto the fresh epoxy mortar surface to eliminate any gloss. After the epoxy mortar has cured sufficiently so that it will not be damaged during sealing operations, the polyethylene insert shall be carefully removed. Joints shall receive a final cleaning with a jet of compressed air to remove al foreign material.

11. When the temperature of the air and the pavement is above 50 degrees Fahrenheit (10° Celsius), the hot poured elastic type joint seal may be placed on the day following the placing of the epoxy resin mortar patch. When the temperature of the air and the concrete is below 50 degrees Fahrenheit (10° Celsius), the time of curing required for the epoxy mortar shall be as determined by ENGINEER.

C. Intermediate Spalls:

1. Spalls larger than 36 square inches (250 cm^2), but not extending below the reinforcing mat, shall be repaired by sawing and chiseling out the unsound concrete and patching with Portland cement mortar.

2. A saw cut at least 1-inch (25 mm) deep shall be made parallel to the joint groove at the outer extremity of the spalled area. The concrete shall be chipped out to the saw cut so that a vertical face is present at the back of the repair area, and the two ends of the repair area shall be trimmed to approximately vertical faces.

3. The area to be repaired shall be sandblasted to remove all loose particles and then blown clean with a jet of compressed air to remove the sand and all other foreign materials. The repair area shall be flushed with clean water and the excess water shall be blown out with compressed air.

4. A heavy polyethylene sheet or a rigid material shall be inserted into the joint groove and held tightly against the joint face that is to be patched.

5. The bottom and vertical faces of the repair area shall be primed with a grout of creamy consistency made with a 1:1 mixture of Portland cement and 2NS sand with water.

6. Prime coat will be scrubbed into the surface with a suitable applicator to insure complete wetting and coverage of all areas to which the Portland cement mortar must bond. Cement grout shall be carefully applied to the rough surfaces of the spall area and shall be applied immediately prior to placing of fresh mortar so that the prime coat is wet when covered by mortar.

7. Portland cement patching material shall be tamped into the repair area and finished level to the pavement surface. Portland cement mortar shall consist of 1-part Portland cement to two (2) parts 2NS sand with a water content of not more than four (4) gallons per sack of cement (35 L per 100 kg of cement). A liquid air-entraining agent to maintain an air content of 8% to 11% shall be added. Calcium chloride in an amount of one (1) percent of the cement content may be added as an accelerator, if approved by ENGINEER.

8. The edge of the patch at the joint face shall conform with the rest of the joint groove.

9. White membrane curing compound shall be sprayed on the patch surface immediately after the mortar is cast and finished. After 72 hours the polyethylene form shall be carefully removed and all patched joints shall receive a final cleaning with a jet of compressed air to remove all foreign material.

D. Major Spalls:

1. When a joint is damaged beneath the depth of the reinforcing mat, it shall be considered a major repair. These major repairs shall be handled on an individual basis under the direction of ENGINEER.

3.18 Sealing Joints

A. Transverse expansion, contraction, construction, and longitudinal bulkhead construction joints shall be filled and sealed with an approved hot-poured elastic type compound.

B. Longitudinal lane-tie joints shall be pressure filled and sealed with either an approved hot-poured or cold-applied elastic type compound. These sealing compounds shall not be placed when the atmospheric or pavement temperatures are less than 50 degrees Fahrenheit (10° Celsius) or when the weather is rainy or foggy.

C. After the shoulders are completed and the pavement has cured, the joints and pavement surfaces on each side of the joints shall be cleaned of extraneous matter. The cleaning shall be done by sandblasting or other methods approved by ENGINEER that will be equally effective in cleaning the concrete. The dust and sand present after the sandblasting or cleaning shall be removed by a jet of compressed air. Hand tools shall be used to remove stones and other foreign materials from the joint groove.

D. Immediately after the joints are cleaned with the compressed air, and with the surface of the concrete in the joint dry, the joint shall be sealed with an approved hot-poured elastic type compound.

E. The hot-poured compound shall be melted in an approved double boiler type kettle. Direct heating will not be permitted. Also, any sealing material heated in excess of the safe heating temperature shall not be used in the Work.

F. During the process of pouring the joints, ENGINEER may, at his discretion, require that sufficient compound be taken from the melting unit to make flow tests. ENGINEER may require CONTRACTOR to modify his method of heating or of charging the heating unit with compound that will produce satisfactory results.

G. Pouring shall be from the melting kettle equipped with an approved pressure pump hose and nozzle. When authorized by ENGINEER, the sealing compound may be poured with a hand-type pouring pot for curbs and short miscellaneous joint lengths, provided a satisfactory joint is obtained.

H. Pouring of the sealing compound shall be done so as to fill the joint to 1/4 inch (5 mm) below top of pavement. Sealing compound spilled on the surface of the pavement shall be removed immediately. After the first pour has cooled to the temperature of the pavement and settled, a second pour shall be made to bring the sealing compound to 1/4 inch (5 mm) of the surface of the pavement. Traffic shall not be permitted over the poured joint until the compound has hardened sufficiently to resist pickup.

I. Longitudinal lane-tie joints shall be cleaned and immediately filled with either an approved hot-poured or cold-applied elastic type compound. Sealing compounds shall be applied with pressure equipment, capable of completely filling the joint.

J. To protect hot-poured and cold-applied sealing compound while it is curing and to prevent pickup by traffic, the sealed joint shall be covered with a strip of paper, 1-1/2 inches (40 mm) wide, or other approved means, immediately following application of the compound. The paper strip shall be left in place until worn off by traffic.

3.19 Traffic Control

A. Provide all measures necessary to protect and maintain traffic and to protect the Work in accordance with Section 01 5000, Temporary Facilities Controls, and with the Michigan Manual of Uniform Traffic Control Devices (M.M.U.T.C.D.).

3.20 Protection against Rain

A. CONTRACTOR shall adequately protect the new concrete from the effects of rain before the concrete has sufficiently hardened.

1. For this Work, CONTRACTOR shall have available on the job site at all times enough burlap or 6-mil (150 μm) thick polyethylene film to cover and protect one day's Work.

B. When rain appears eminent, all operations shall stop and personnel shall begin covering. As soon as the rain ceases, the concrete shall be uncovered and the surface burlap dragged where necessary.

C. Curing compound shall be applied to any areas where the compound has been disturbed or washed away. Protection of the new concrete against rain shall be at CONTRACTOR's expense.

3.21 Cold Weather Protection

A. Any time there is a danger of freezing temperatures, CONTRACTOR shall have available on-site a sufficient amount of clean, dry straw or hay or polyethylene film or other approved materials to cover at least one (1) day's production. Cold weather protection shall be at CONTRACTOR's expense.

B. The source of the temperature shall be taken from forecasts prepared by the local weather bureau, recognized as the Official Weather Bureau for the area the new Work is being constructed. The predicted low temperature shall be that forecast to occur during the next 24 hours.

C. Frozen material shall not be charged into the mixer at any time.

D. Frost or ice shall be removed from the forms and any steel used in the pavement, prior to placing concrete.

E. Concrete shall not be placed directly upon a frozen subgrade. The subgrade shall be covered with a layer of straw or hay 12 inches (300 mm) in thickness to protect it against freezing. The straw or hay shall be removed from the finished subgrade immediately ahead of paving operations and piled along the line of construction for use in covering the finished pavement. Prior to the placing of concrete, the subgrade shall be cleaned of loose straw and otherwise prepared in a manner satisfactory to ENGINEER. Other covering materials as approved by ENGINEER may be used to prevent subgrade freezing.

F. To accelerate hardening of the concrete when the temperature of the air in the shade and away from artificial heat is between 45 and 40 degrees Fahrenheit (7° to 4° Celsius), calcium chloride shall be added to the mix at the rate approved by ENGINEER. The calcium chloride shall be spread on the materials immediately before discharging into the drum of the mixer. A method approved by ENGINEER, shall be used for measuring the amount of dry calcium chloride to be added to each batch of concrete. The calcium chloride shall not be placed in contact with the cement.

G. Immediately after finishing of the concrete and as soon as hardening of the concrete will permit, the pavement shall be covered and the protective covering shall remain in place until the concrete has developed a compressive strength of not less than 3,000 pounds per square inch (21 MPa) or for a minimum period of 14 days or as approved by ENGINEER.

H. The protective covering shall be placed around and over the forms and it shall extend beyond the edge of the pavement for a distance at least equal to the depth of covering required.

I. When removing forms, the protective covering should be removed for as short a time as possible and should be replaced promptly to prevent loss of heat.

J. The mixing and placing of concrete shall stop in sufficient time each day to permit finishing of the concrete and the placing of the required protective covering during daylight hours.

K. The requirements specified herein for the curing and protection of concrete in cold weather are minimum requirements, and CONTRACTOR shall be responsible for the quality and strength of the concrete placed. Concrete damaged by frost action shall be removed and replaced at CONTRACTOR's expense.

L. Between October 15 and May 15, when the predicted low temperature is to be below 35 degrees Fahrenheit (2° Celsius) at any time within 72 hours after placing the pavement, the pavement shall be protected and such protective covering shall remain in place until the concrete has developed a compressive strength of not less than 3,000 psi. (21 MPa), or for a minimum period of 14 days, unless otherwise authorized by ENGINEER.

M. Special Protection:

1. No pavement may be placed between October 15 and May 15, unless it is specifically provided for in the Contract Documents, or authorized by ENGINEER, except that in no case shall concrete be placed when the predicted high temperature is to be below 35 degrees Fahrenheit (2° Celsius), without written permission of ENGINEER. When paving is permitted during the period, the following requirements shall apply:

2. The temperature of the concrete at the time it is placed on the subgrade shall be not less than 50 degrees Fahrenheit (10° Celsius), nor more than 85 degrees Fahrenheit (30° Celsius).

3. In order to maintain a mix temperature between 50 degrees Fahrenheit (10° Celsius) and 85 degrees Fahrenheit (30° Celsius) the mixing water or the aggregates, or both, shall be heated as required by ENGINEER. The water and the aggregates shall be heated to a temperature of not more than 150 degrees Fahrenheit (65° Celsius). The heating of aggregates shall be done by the use of steam pipe under the aggregate piles, or by free steam discharged into the aggregate piles, or by steam pipe in the batching bins. The heating of the water and the aggregates shall be controlled so that there will not be any large differences in temperature from batch-to-batch.

4. When there is any danger of the predicted low temperature dropping below 35 degrees Fahrenheit (2° Celsius) all the necessary materials for covering and protecting the concrete, equipment for heating the water and aggregates, when required, and calcium chloride shall be on the Project and available for immediate use for the required method of curing and cold weather protection before any pavement is placed.

5. For predicted low temperatures from 35 to 25 degrees Fahrenheit (2 to -4° C) either 1-layer of waterproof paper blankets or 1-foot (300 mm) of loose dry straw or hay shall be placed.

6. For predicted low temperatures of 20 to 25 degrees Fahrenheit (-7 to -4° Celsius) 1-layer of waterproof paper blankets and 1-foot (300 mm) of loose dry straw or hay shall be placed.

7. For predicted low temperatures less than 20 degrees Fahrenheit (-7° Celsius) the minimum requirement for cold weather protection will be 1-layer of waterproof paper blankets and 1-foot (300 mm) of loose dry straw or hay overlayed with a waterproof protective covering consisting of tarpaulins, paper blankets, polyethylene sheeting or other approved material.

N. When temperature are such that special protection is required as specified above, all concrete placed within the proceeding 72 hours shall be similarly protected.

O. When special protection is started, it shall be continued until design strength is reached in accordance with the above requirements unless warmer temperatures prevail for a period of at least 48 hours. Permission to eliminate special protection for such a period shall be as approved by ENGINEER.

P. Protection of the new concrete against cold weather including ordinary and special protection shall be at CONTRACTOR's expense.

3.22 Concrete Temperature Limitations

A. Concrete shall not be placed when the temperature of the concrete at the point of placement is above 90 degrees Fahrenheit (32°Celsius).

3.23 Curb Drop

A. Curb drops shall be provided for existing and future sidewalk ramps, for approaches for existing driveways and at other locations as determined by ENGINEER.

B. Curb drops for sidewalks shall be in accordance with the current rules and regulations of Act 8, Michigan PA 1973, as amended. Curb drops for drive approaches shall be centered with the existing driveway at the property line.

C. Width of the residential curb drop shall be equal to the width of the driveway determined at the property line plus four feet. Unless otherwise approved by ENGINEER, the minimum width of the residential curb drop shall be 14 feet (4.5 m).

3.24 Shoulders

A. Shoulders shall be constructed according to the lines, grades, and cross section shown on the Plans and as specified for the particular type of shoulder material required. Shoulders shall be done in such sequence with the surfacing operations that they will be completed not more than seven (7) days after the expiration of the curing period, unless otherwise directed by ENGINEER.

B. Aggregate shoulders, when called for, shall be constructed according to the requirements specified under Section 32 1123, Aggregate Base Courses.

3.25 Cleanup

A. After the concrete has gained sufficient strength, but no sooner than within 12 hours, the fixed forms shall be removed and the spaces on both sides shall be immediately backfilled with sound earth of topsoil quality.

B. Backfill shall be compacted, leveled and left in a neat, workmanlike condition.

C. At a seasonally correct time approved by ENGINEER, the disturbed area shall be raked, have topsoil placed thereon, fertilized and seeded per the requirements of Section 32 9219, Seeding, or sodded in accordance with Section 329223, Sodding.

3.26 Opening Pavement

A. ENGINEER reserves the right to require that curing operations be discontinued when the concrete has reached 85% of the design strength, and to require that the shoulders be completed and the slab be opened to traffic.

3.27 Monument Boxes

A. Government, plat, and street intersection monuments within existing or proposed pavement shall be preserved by enclosing in standard monument boxes. Monument box castings shall be furnishing and installed by CONTRACTOR.

B. Existing monument boxes shall be adjusted to meet the proposed pavement elevation by removing the castings and resetting to the required elevation.

C. Support for the monument box shall be concrete bedding, so constructed as to hold them firmly in place.

D. The adjacent pavement, curb, or curb and gutter shall be replaced to the new elevation, condition and kind of construction, unless otherwise provided.

3.28 Testing

A. During the course of the Work, ENGINEER may require the taking of standard test scores and cylinders, by a testing laboratory acceptable to OWNER and approved by ENGINEER. Cost of testing and coring shall be at the expense of OWNER.

B. For each lane of Work:

1. A minimum of one (1) cylinder for testing compressive strength shall be made for each 500 linear feet (150 m), or fraction thereof, or as determined by ENGINEER.

2. A minimum of two (2) cores for testing compressive strength and for checking thickness shall be drilled each 500 feet (150 m), or fraction thereof.

3. The making of cylinders, the drilling of cores and testing shall be at the expense of OWNER.

C. Slump tests for consistency of Portland cement concrete shall be made in accordance with ASTM C143 and C172.

D. In the event the test results on a core indicates a deficiency in either thickness or compressive strength or in the event the test results on a cylinder indicates a deficiency in compressive strength, the following adjustments in the unit price for concrete shall be made based on the average of three (3) cores:

Under Required Thickness	Percent of Reduction in Unit Price
0" to 1/4" (0 to 5 mm)	None
by more than a 1/4", but not exceeding a ½" (56 mm to 10 mm)	20
by more than a 1/2", but not exceeding 1" (03 mm to 25 mm)	50
by more than 1" (greater than 25 mm)	Remove & Replace

Under Required Compressive Strength	Percent of Reduction in Unit Price
0 to 150 psi (0 to 1 MPa)	None
by more than 150 psi, but not exceeding 300 psi (1 MPa to 2 MPa)	20
by more than 300 psi, but not exceeding 500 psi (2 MPa to 3.5 MPa)	50
by more than 500 psi (Greater than 3.5 MPa)	Remove & Replace

E. Reduction in the unit price are additive, that is if an area is deficient by 3/8 of an inch (9 mm) and is under strength by 200 psi (1.4 MPa), the total reduction is 20% plus 20% or a reduction of 40%.

F. The area of a deficient core shall be determined by the drilling and testing of two (2) additional cores, one (1) on each side of the deficient core and 20 feet (6 m) from it, when possible.

G. The extra core drilling and testing shall be at CONTRACTOR's expense.

End of Section

Section 32 1315
Sidewalks and Driveways

Part 1 General

1.01 Scope of Work

A. This Section includes sidewalks, sidewalk ramps, driveways, and drive approaches complete with concrete materials, concrete curing compounds, joint materials, field quality control and appurtenances.

1.02 Related Work Specified Elsewhere

A. Section 31 1100: Clearing and Grubbing
B. Section 31 2313: Subgrade Preparation
C. Section 32 9219: Seeding
D. Section 32 9223: Sodding

1.03 Reference Standards

A. Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

1. ASTM - American Society of Testing and Materials

2. AASHTO - American Association of State Highway and Transportation Officials

3. MDOT - Michigan Department of Transportation, 2003 Standard Specifications for Construction

1.04 Submittals

A. Written permission for the use of all local disposal sites shall be obtained and copies shall be furnished to ENGINEER.

B. At the request of ENGINEER, CONTRACTOR shall provide ENGINEER with certification that the various materials to be used conform to the ASTM Standards referred to in the Specification.

1.05 Test Reports

A. ENGINEER shall be provided with two (2) certified copies of the test results of the thickness and compressive strength of the concrete. Core drilling, testing for thickness and compressive strength and the certification of the test results shall be performed by a testing laboratory approved by ENGINEER.

1.06 Environmental Requirements

A. Comply with the requirements for concrete installation due to outside ambient air temperatures specified under Article 3.11 of this Section.

1.07 Protection

A. Comply with the requirements for protecting new Work against damage from rain, as specified under Article 3.11 of this Section.

B. Comply with the requirements for protecting new Work against damage from cold weather, as specified under Article 3.11 of this Section.

Part 2 Products

2.01 Concrete

A. Concrete shall be in accordance with MDOT Section 601 or 701, use Grade P1 or S2, 3,500 psi (24 MPa) strength; Type IA cement; 6.0 sacks cement per cubic yard (335 kg/m^3); 6A coarse aggregate; 2NS fine aggregate; 6.5% ± 1.5% air content; 3-inch (75 mm) maximum slump; no admixtures without ENGINEER's approval. Type IIIA cement may be used for high-early strength concrete.

2.02 Ready-Mixed Concrete

A. Ready-mixed concrete shall conform to ASTM C94, Alternate 2.

2.03 Water

A. Water to be used for mixing and curing concrete shall be reasonably clean and free from oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product. Waters from sources approved by the Michigan State Department of Public Health as potable may be used without test. Water requiring testing shall be tested in accordance with the current Method of Test for Quality of Water to be Used in Concrete, AASHTO T26, and as specified in MDOT, Section 911.

2.04 Concrete Curing Compounds

A. White membrane curing compound for curing concrete shall conform to ASTM C309, Type 2, Class B Vehicle, and as specified in MDOT, Section 903.05.

2.05 Premolded Joint Filler

A. Fiber joint filler for expansion joints shall conform to ASTM D1751. Filler shall be of the thickness, as specified herein, or on the Plans, or as approved by NGINEER.

2.06 Steel Hook Bolts

A. Hook bolts shall conform to ASTM A706, or Grade 60 of ASTM A615, A616, or A617, and as specified in MDOT, Section 914.09.C. Hook bolts shall be 5/8 inch (16 mm) diameter.

2.07 Joint Sealant

A. Hot-poured type joint sealant shall conform to ASTM D3405 and as specified in MDOT Section 914.04.

2.08 Concrete Mix

A. Concrete shall contain a minimum of six sacks, 94 pounds per sack, of cement per cubic yard (335 kg/m^3) and shall yield a minimum compressive strength of 3,500 psi (24 MPa) at 28 days.

B. Cement shall be air-entraining Portland cement ASTM C150, Type 1A. If high-early strength concrete is desired, Type IIIA is required.

C. High-early concrete can be obtained for small areas by the addition of one sack of cement, Type 1A, per cubic yard of concrete (56 kg/m^3).

D. The air content of the concrete shall be 6.5%± 1.5% by volume.

E. Maximum slump of the concrete shall be three (3) inches (75 mm).

F. Ready-mixed concrete in accordance with ASTM C94, Alternate 2, shall be used, unless a written request for other than ready-mixed concrete has been submitted, reviewed and approved by ENGINEER.

Part 3 Execution

3.01 Verification of Excavation and Forming

A. Prior to the installation of any concrete, examine the excavation and forms for the proper grades, lines, and levels required to receive the new Work. Ascertain that excavation and compacted subgrades are adequate to receive the concrete to be installed.

B. Correct all defects and deficiencies before proceeding with the Work.

3.02 Existing Improvements

A. Investigate and verify location of existing improvements to which the new Work is to be connected.

B. Adjustments in line and grade to align the new Work with the existing improvements must be approved by ENGINEER, prior to any change.

3.03 Forming

A. Forms shall be of wood or metal, straight and free from warp, clean, and of sufficient strength to resist springing during the process of depositing concrete against them.

B. Forms shall be the full depth of the concrete.

3.04 Sidewalks, Sidewalk Ramps, Driveways, and Driveway Approaches

A. Unless otherwise noted in the Contract Documents, all sidewalks and sidewalk ramps shall be four (4) inches (100 mm) thick except at driveways, where the thickness of the sidewalks shall be six (6) inches (150 mm). Sidewalks shall be five (5) feet (1.5 m) wide unless otherwise noted on Plans, and shall slope 1/4 inch per foot (20 mm/m) towards the surface drainage side which in general will be towards the center of the road. Normally sidewalks will be located within the right-of-way, parallel the property lines, at a distance of 1-foot (300 mm) from the property line.

B. Driveways and approaches shall be six (6) inches (150 mm) thick. The width of driveways and driveway approaches shall be as specified on the Plans or as determined by ENGINEER.

3.05 Remove Curb for Curb Drop

A. Construction of sidewalk ramps within street intersections where curbed pavement exists shall conform to the current rules and regulations of Act 8, Michigan PA 1973.

B. Where there is no proper curb drop for the sidewalk ramp or driveway approach, CONTRACTOR shall saw cut, to full depth of pavement, and remove a minimum of an 18-inch (450 mm) wide curb and gutter section. When mountable curbs are present, CONTRACTOR shall remove a 24-inch (600 mm) wide curb and gutter section for the construction of sidewalk ramp, as specified above.

C. Length of curb and gutter removal shall be determined by ENGINEER in the field but shall be at least as wide as the proposed sidewalk ramp plus 1-foot (300 mm) on each side.

D. Removed curb and gutter section shall be replaced with material, equal to what was removed and the joint sealed with hot poured rubber asphalt.

E. CONTRACTOR shall install 5/8 inch (15 mm) diameter self tapping hook bolts, in the existing concrete pavement as indicated on the Plans prior to placing concrete for the removed curb and gutter section.

F. Curbs may be cut or ground down with an approved concrete grinder when the final results will leave the cut or ground down curb in a smooth, clean condition acceptable to ENGINEER. Curbs that are cut or ground down that are not acceptable to ENGINEER, shall be removed and replaced as specified above at no additional cost.

3.06 Placement of Forms

A. Wood forms, straight and free from warp, of nominal depth may be used for sidewalk sections less than 25 feet (7.5 m) in length.

B. Forms shall be staked to line and grade in a manner that will prevent deflection and settlement.

C. When unit slab areas are to be poured, slab division forms shall be so placed that the slab division joints will be straight and continuous.

D. Forms shall be set for sidewalk ramps to provide a grade toward the centerline of the right-of-way in accordance with current standards. The grade shall be uniform, except as may be necessary to eliminate short grade changes.

E. Forms shall be oiled before placing concrete. Forms shall remain in place at least 12 hours after the concrete is placed. There shall be sufficient forms placed ahead of the pouring operations to maintain uninterrupted placement of concrete.

F. The use of slip form pavers can be allowed when approved by ENGINEER in lieu of the construction system described above.

3.07 Joints

A. Transverse and longitudinal expansion and plane-of- weakness joints shall be constructed at the locations specified herein, or as indicated on the Plans or as approved by ENGINEER.

B. Transverse expansion joints shall be placed for the full width and depth of the new Work. The transverse expansion joints placed against any existing pavement shall be a minimum of six (6) inches (150 mm) deep but no less than the thickness of the concrete being placed.

C. Longitudinal expansion joints shall conform to the same requirements as transverse expansion joints.

D. Joints shall be constructed true to line with their faces perpendicular to the surface of the sidewalk. The top shall be slightly below the finished surface of the sidewalk. Transverse joints shall be constructed at right angles to the centerline of the sidewalk and longitudinal joints shall be constructed parallel to the centerline or as determined by ENGINEER.

E. Unless otherwise specified on the Plans or unless otherwise determined by ENGINEER, when the sidewalk is constructed in partial width slabs, transverse joints in the succeeding slabs shall be placed in line with like joints in the adjacent slab. Also, in the case of widening existing sidewalks, transverse joints shall be placed in line with like joint in the existing sidewalk.

F. Transverse expansion joints, 1/2 inch (10 mm) thick, shall be placed through the sidewalk at uniform intervals of not more than 50 feet (15 m) and elsewhere as shown on the Plans, or as determined by ENGINEER.

G. Expansion joints, 1/2 inch (10 mm) thick, shall also be placed between the sidewalk and back of abutting parallel curb, buildings or other rigid structures, concrete driveways and driveway approaches. The expansion joint between sidewalks and buildings shall be placed 1-foot from the property line and parallel to it.

H. Expansion joints, 1-inch (25 mm) thick, shall be placed between sidewalk ramps or driveway approaches and the back of curbs.

I. Plane-of-weakness joints shall be formed every five (5) feet (1.5 m) and shall be produced by use of slab divisions forms extending to the full depth of the concrete or by cutting joints in the concrete, after floating, to a depth equal to 1/4 the thickness of the sidewalk. Cut joints shall not be less than 1/8 inch (3 mm) nor more than 1/4 inch (5 mm) in width and shall be finished smooth and shall be at right angles to the centerline of the sidewalk.

3.08 Placing and Finishing Concrete

A. Concrete shall be placed on a prepared unfrozen, smooth, leveled, rolled and properly compacted base as indicated on the Plans. The surface of the subbase shall be moist with no visible water present prior to placement of the concrete.

B. Concrete shall be deposited, in a single layer, to the depth specified in the Plans or in the Proposal. Concrete shall be thoroughly spaded or vibrated and compacted to fill in all the voids along the forms and joints. Concrete shall be struck off with a strike board until all voids are removed and the surface has the required grade and cross section as indicated on the Plans.

C. The surface of the concrete shall be floated just enough to produce a smooth surface free from irregularities. All edges and joints shall be rounded with an edger having a 1/4 inch (5 mm) radius. The surface of sidewalks, driveways and approaches shall be broomed to slightly roughen the surface.

D. The surface of sidewalk ramps shall be textured with a coarse broom transversely to the ramp slope. The texture on sidewalk ramps shall be coarser than the remainder of the sidewalk.

3.09 Curing

A. After finishing operations have been completed and immediately after the free water has left the surface, the surface of the concrete (and sides if slip-forming is used) shall be completely coated and sealed with a uniform layer of white membrane curing compound.

B. The curing compound shall not be thinned. The curing compound shall be applied at the rate of 1-gallon per 200 square feet (4 L per 20 m^2) of surface.

3.10 Barricades

A. Suitable barricades and lights shall be placed around all newly poured sidewalks, sidewalk ramps, driveways, driveway approaches and curb and gutter section in order to protect the new Work from damage from pedestrians, vehicles and others until the concrete has hardened.

B. Barricades shall be left in place for a minimum of two (2) days, except for driveway approaches and curb and gutter section. Barricades shall remain in place for a minimum of three (3) days.

C. Concrete that suffers surface or structural damage shall be removed and replaced by CONTRACTOR at his expense.

3.11 Protection

A. CONTRACTOR shall adequately protect the new concrete from the effects of rain before the concrete has sufficiently hardened. For this Work CONTRACTOR shall have available on the job site at all times enough burlap or 6-mil thick polyethylene film to cover and protect one (1) day's work. When rain appears eminent, operations shall stop and personnel shall begin covering. As soon as the rain ceases, the concrete shall be uncovered and the surface burlap dragged where necessary. Curing compound shall be applied to any areas where the compound has been disturbed or washed away.

B. If concrete is placed between October 15 and May 15, CONTRACTOR shall have available on the site sufficient amount of clean, dry straw or hay to cover one day's production. If the temperature reaches 40 degrees Fahrenheit (4 degrees Celsius) and is falling, the hay or straw shall be placed 12 inches (305 mm) thick, immediately after the curing compound is applied. If the temperature is 30 degrees Fahrenheit (-1 degrees Celsius) and falling the curing shall be by 6-mil thick polyurethane film placed on the concrete as soon as the surface moisture has disappeared, and then covered with 12 inches (300 mm) of straw or hay.

C. Also, whenever the temperature in the shade falls below 50 degrees Fahrenheit (10 degrees Celsius), the water, sand and coarse aggregate shall be heated in that order sufficiently to maintain a uniform temperature of the concrete at between 70 degrees Fahrenheit and 80 degrees Fahrenheit (21 to 27 degrees Celsius).

D. Concrete shall not be placed when the temperature of the concrete at the point of placement is above 90 degrees Fahrenheit (32 degrees Celsius).

3.12 Cleanup

A. After the concrete has gained sufficient strength, but no sooner than within 12 hours, the fixed forms shall be removed and the spaces on both sides shall be immediately backfilled with sound earth of topsoil quality. Backfill shall be compacted, leveled and left in a neat, workmanlike condition.

B. At a seasonally correct time approved by ENGINEER, the disturbed area shall be raked, have topsoil placed thereon, fertilized and seeded per the requirements of Section 32 9219, Seeding, or sodded in accordance with Section 32 9223, Sodding.

3.13 Testing

A. ENGINEER may require that a minimum of two cores be drilled from the sidewalk for each 500 (or fraction thereof) linear foot (150 m) section placed. At least one (1) core out of two (2) required will be taken from the sidewalk at the driveway. One (1) core may be required from every 20 (or fraction thereof) of driveway approaches or sidewalk ramps installed.

B. Cores shall be checked for depth and compressive strength. Core drilling and tests shall be done by a testing laboratory designated by OWNER and at the expense of OWNER. The testing laboratory shall furnish ENGINEER with two (2) certified copies of the test results.

C. In the event the test results on a core indicates a deficiency in either thickness or compressive strength the following adjustments in the unit price for concrete shall be made:

Thickness

Under Required Thickness	Percent of Reduction in Unit Price
0" to 1/4" (0 to 5 mm)	None
by more than a 1/4", but not exceeding a ½" (56 mm to 10 mm)	20
by more than a 1/2", but not exceeding 1" (03 mm to 25 mm)	50
by more than 1" (greater than 25 mm)	Remove & Replace

Compressive Strength

Under Required Compressive Strength	Percent of Reduction in Unit Price
0 to 150 psi (0 to 1 MPa)	None
by more than 150 psi, but not exceeding 300 psi (1 MPa to 2 MPa)	20
by more than 300 psi, but not exceeding 500 psi (2 MPa to 3.5 MPa)	50
by more than 500 psi (Greater than 3.5 MPa)	Remove & Replace

D. The area of the deficient core shall be determined by the drilling and testing of two (2) additional cores, one (1) on each side of the deficient core and 20 feet (6 m) from it when possible. Extra core drilling and testing shall be at the expense of CONTRACTOR.

Reductions due to deficiencies in thickness or compressive strength are additive, that is, if an area is deficient by 3/8 inch (9 mm) and under strength by 200 psi (1.3 MPa), the total reduction is 20% plus 20% or 40% reduction.

End of Section

Section 32 1500
Aggregate Surfacing

Part 1 General

1.01 Scope of Work

A. This section includes the requirements for constructing aggregate surfacing.

1.02 Related Work Specified Elsewhere

A. Section 31 2198: Site Construction Performance Requirements
B. Section 31 2313: Subgrade Preparation
C. Section 32 1216: Bituminous Paving
D. Section 32 1313: Concrete Paving
E. Section 32 9219: Seeding
F. Section 32 9223: Sodding

1.03 Reference Standards

A. Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

1. ASTM - ASTM International

2. AASHTO - American Association of State Highways and Transportation Officials

3. MDOT - Michigan Department of Transportation, 2003 Standard Specifications for Construction

1.04 Allowable Tolerances

A. Finished surface shall be shaped to conform to plan grade and cross section within a tolerance of 3/4 inch in ten (10) feet (30 mm per 5 m).

1.05 Test Reports

A. Testing lab shall provide ENGINEER with two (2) certified copies of the test results of the thickness of the compacted aggregate. Core drilling, testing for thickness and the certification of the test results shall be performed by a testing laboratory approved by ENGINEER.

1.06 Stockpiling Aggregate

A. Aggregate shall be deposited in stockpiles in such a manner that the material may be removed from the stockpile by methods which will provide aggregate having a uniform gradation.

B. Stockpiling of aggregate, in excess of four (4) feet (1.2 m) in depth, on the completed subbase or aggregate surface will not be permitted, except with the approval of ENGINEER.

1.07 Environmental Requirements

A. Comply with the requirements for aggregate base or surfacing installations due to outside ambient air temperatures specified under Article 3.10 of this Section.

Part 2 Products

2.01 Dense-Graded Aggregate

A. The dense-graded aggregate gradation shall conform to ASTM D693 and to dense-graded aggregate, Series 22 and 23 as specified in MDOT, Section 902.06.

2.02 Calcium Chloride Additives

A. The calcium chloride additives shall conform to ASTM D98 and as specified in MDOT, Section 903.02.

2.03 Water

A. Water used for compaction and dust control shall be reasonably clean and free from substances injurious to the finished product. Water from sources approved by the Michigan State Department of Public Health as potable may be used.

Part 3 Execution

3.01 Excavation Verification

A. Prior to the placing of any aggregate material, examine the excavation for the grades, lines, and levels required to receive the new Work. Ascertain that all excavation and compacted subgrades or subbases are adequate to receive the new Work. Correct defects and deficiencies before proceeding with the Work.

3.02 Subgrade Conditions

A. Prior to the placing of any aggregate material, examine the subgrade or subbase to ascertain that it is adequate to receive the aggregate to be placed. If the subgrade or subbase remains wet after all surface water has been removed, ENGINEER may require the installation of edge drain.

3.03 Existing Base

A. Prior to the placing of any aggregate material for surfacing, examine the existing base for grade and condition to receive the new Work. Ascertain that the base is adequately compacted to receive the aggregate surfacing to be installed.

B. Correct all defects and deficiencies before proceeding with the Work.

3.04 Existing Improvements

A. Investigate and verify locations of existing improvements, including structures, to which the new Work will be in contact.

B. Necessary adjustments in line and grade, to align the new Work with the existing improvements must be approved by ENGINEER, prior to any changes.

3.05 Preparation of Subgrade or Subbase

A. Subgrade or subbase shall be fine graded to the cross section indicated on the Contract Drawings, and shall be thoroughly compacted prior to the placing of the aggregate material.

3.06 Installation - General

A. Width, thickness, and type of aggregate materials shall be indicated on the Contract Drawings or as directed by ENGINEER.

B. No aggregate material shall be placed until the subgrade, or subbase, or existing aggregate surface has been approved by ENGINEER.

3.07 Aggregate Surface Course

A. Where the base for the new aggregate surface course is an existing aggregate surface, the existing surfacing, shall be either graded or scarified and graded to remove irregularities and to provide a bond between the old and new surfaces.

B. Aggregate surface course shall be placed by a mechanical spreader or other approved means, in uniform layers to such a depth that when compacted, the course will have the thickness shown on the Contract Drawings.

C. Depth of the surface course, when compacted, shall not exceed six (6) inches (150 mm), unless otherwise specified on the Contract Drawings or directed by ENGINEER. Aggregate shall be of a uniform mixture when placed on the prepared base. It shall be uniformly spread and then trimmed with a road grader, trimmer or other approved means until the surface is free from waves and irregularities. The trimming shall be alternated by rolling with a pneumatic-tired or tamping type roller. The entire operation shall continue until the surface course is compacted to at least 95% of maximum unit weight.

D. When the operation is completed, the surface course shall conform to the required lines, grades and cross sections.

E. Optimum moisture content shall be maintained until the prescribed unit weight is obtained and each layer shall be compacted until the maximum unit weight is attained before placing the succeeding layer.

F. When approved by ENGINEER, additional water may be applied by an approved means, to the aggregate to aid in the compaction and shaping of the material.

G. With the approval of ENGINEER, chloride additives may be used by CONTRACTOR to facilitate his compaction and maintenance of the aggregate surface. Amount and method of combining the chloride additives are at the option of CONTRACTOR and are at his expense.

3.08 Aggregate Shoulders and Approaches

A. Construction of shoulders and approaches shall be of the material, width and depth as shown on the Contract Drawings.

B. When shoulders and approaches are specified by class, they shall conform to MDOT, Section 307 for shoulders and approaches specified as: Class I, Class II, Class III or Class IV.

C. Subgrade for the shoulders and approaches shall be graded to an elevation below the finished surface that will permit the placing of the specified thickness of materials.

D. Subgrade of shoulders and approaches shall be approved by ENGINEER prior to the placing of aggregate.

E. Aggregate shall be placed on the prepared subgrade by a mechanical spreader or other approved means, to a depth of not more than five (5) inches (125 mm). If the specified thickness exceeds five (5) inches (125 mm), the shoulder or approach shall be constructed in two or more courses.

F. Dumping the aggregate on the road surface and grading it onto the shoulder or approach will not be permitted.

G. Aggregate shall be compacted to not less than 100% of the maximum unit weight for the first five (5) feet (1.5 m) outside of the pavement edge and 98% of the maximum unit weight for the remainder of the area. When the operation is completed, the surface course shall conform to the required lines, grades and cross sections.

H. On resurfacing projects, the existing aggregate shoulder or approach shall be scarified prior to the placing of new aggregate materials. Placement of aggregate shall proceed the placing of the top course of bituminous mixture on the adjoining pavement. Final shaping and compaction of the shoulder or approach shall follow the placement of the top course of bituminous mixture unless otherwise directed by ENGINEER.

I. Optimum moisture content shall be maintained until the prescribed unit weight is obtained and each layer shall be compacted until the maximum unit weight is attained before placing the succeeding layer.

J. When approved by ENGINEER, additional water may be applied by an approved means, to the aggregate to aid in the compaction and shaping of the material.

K. With the approval of ENGINEER, chloride additives may be used by CONTRACTOR to facilitate his compaction and maintenance of the aggregate surface. The amount and method of combining the chloride additives are at the option of CONTRACTOR and are at his expense.

3.09 Maintenance During Construction

A. Aggregate surface shall be continuously maintained in a smooth and firm condition during all phases of the construction operation.

B. CONTRACTOR, at his expense, shall provide additional materials needed to fill depressions or bind the aggregate.

3.10 Temperature Limitations

A. Aggregate materials shall not be placed when there are indications that the mixtures may become frozen before the maximum unit weight is obtained.

B. In no case shall the aggregate be placed on a frozen subgrade or base course unless otherwise directed by ENGINEER.

3.11 Cleanup

A. Immediately following the compacting of the surface course, the voids on both sides of the aggregate course shall be backfilled with sound earth of topsoil quality.

B. Backfill shall be compacted, leveled and left in a neat, workmanlike condition.

C. At a seasonally correct time approved by ENGINEER, the disturbed area shall be raked, have topsoil placed thereon, fertilized and seeded per the requirements of Section 32 9219, Seeding or sodded in accordance with Section 32 9223, Sodding.

3.12 Opening Aggregate Surfaced Roads

A. ENGINEER reserves the right to open the aggregate surfacing to traffic at any time during construction.

3.13 Monument Boxes

A. Government, plat, and street intersection monuments within existing or proposed pavement shall be preserved by enclosing in standard monument boxes. Monument box castings shall be furnished and installed by CONTRACTOR and shall be East Jordan Iron Works No. 1570, or approved equal.

B. Existing monument boxes shall be adjusted to meet the proposed pavement elevation by removing the castings and resetting to the required elevation. Support for the monument box shall be concrete bedding, so constructed as to hold them firmly in place. Adjacent pavement, curb, or curb and gutter shall be replaced to the new elevation, condition, and kind of construction, unless otherwise provided.

3.14 Testing

A. During the course of the Work, ENGINEER may require testing for compaction or density and for thickness of material. Testing and coring required shall be performed by a testing laboratory acceptable to OWNER and approved by ENGINEER. Cost for testing and coring shall be at the expense of OWNER.

B. When thickness tests are done, a minimum of one depth (thickness) measurement will be made every 400 linear feet (120 m) per traffic lane. Lane width shall be as indicated on the Contract Drawings or as determined by ENGINEER.

1. If two (2) lanes are constructed simultaneously, only one test is necessary to represent both lanes.

2. For areas such as intersections, entrances, cross-overs, ramps, widening strips, acceleration and deceleration lane, at least one depth measurement will be taken for each 1,200 square yards (1000 m^2) of such areas or fraction thereof.

3. The location of the depth measurement will be at the discretion of ENGINEER.

C. The maximum unit weight when used as a measure of compaction or density of soils shall be understood to mean the maximum unit weight per cubic foot (or cubic meter) as determined by ASTM D1557, Method D.

3.15 Defective Work

A. Thickness:

1. Measurements of aggregate base course thickness will be made to the nearest 1/4 inch (5 mm).

   a. Depths may be 1/2 inch (10 mm) less than the thickness indicated on the Contract Drawings provided that the average of measurements taken at regular intervals shall be equal to or greater than the specified thickness.

   b. In determining the average in place thickness, measurements which are more than 1/2 inch (10 mm) in excess of the thickness indicated on the Contract Drawings will be considered as the specified thickness plus 1/2 inch (10 mm).

2. Locations of the depth measurements will be as specified herein unless otherwise directed by ENGINEER. Sections found to be deficient in depth shall be corrected by CONTRACTOR using methods approved by ENGINEER.

B. Weight:

1. When the aggregate material is measured by weight in Tons (or metric tons), the pay weights for aggregates will be the scale weight of the material, including admixtures, unless the moisture content is more than six (6) percent.

   a. Moisture tests will be made at the start of weighing operations and at any time thereafter when construction operations, weather conditions or any other cause may result in a change in the moisture content of the material.

   b. If the tests indicate a moisture content in excess of six (6) percent, the excess over six (6) percent will be deducted from the scale weight of the aggregate until such time as moisture tests indicate that the moisture content of the material is not more than six (6) percent.

End of Section

Section 32 1723
Pavement Markings

Part 1 General

1.01 Scope of Work

A. This Section includes pavement markings complete with materials, layout of markings and preparation of pavement surfaces.

1.02 Reference Standards

A. Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

1. ASTM - American Society of Testing and Materials

2. AASHTO - American Association of State Highways and Transportation Officials

3. MDOT - Michigan Department of Transportation, 2003 Standard Specifications for Construction

1.03 Requirements of Regulatory Agencies

A. Where applicable pavement markings shall conform to the current requirements of the Michigan Manual of Uniform Traffic Control Devices (M.M.U.T.C.D.) issued under provisions of the Michigan Vehicle Code, Act 300, PA 1949, as amended.

1.04 Submittal of Manufacturer's Literature

A. Submit manufacturer's literature of all paints to be used in the Work. Manufacturer's literature shall show paint: type, texture, color, temperature limitations, recommended use, spreading rate, drying time, and cleanup.

1.05 Product Delivery, Storage and Handling

A. Deliver all materials to the Project site in original, unopened waterproof containers. Packaging containers shall bear manufacturing labels intact and legible. The label shall contain the following information: name and address of manufacturer, shipping point, trade mark or trade name, kind of paint, formula, amount in U.S. gallons, date of manufacture and lot number, type of paint and AASHTO Specification Number.

B. Store all materials in waterproof containers, under protective covering, off the ground and away from extreme heat or cold until ready for use.

C. Handling of materials shall be in accordance with the manufacturer's recommendations.

1.06 Environmental Requirements

A. CONTRACTOR shall comply with the appropriate environmental limitations (air temperature, pavement temperature, and relative humidity) as outlined in the MDOT section 811.03.

Part 2 Products

2.01 Regular Dry Traffic Marking Paint

A. Regular drying pavement marking paint in white and yellow colors shall conform to AASHTO M248, Type N traffic paint and shall meet the current MDOT specified ingredients for regular drying traffic paint and shall be selected from MDOT's Qualified Products List.

2.02 Fast Dry Polyester Pavement Marking Paint

A. Fast drying pavement marking paint in white and yellow colors shall conform to AASHTO M248, Type F traffic paint and shall meet the current MDOT specified ingredients for fast drying traffic paint and shall be selected from MDOT's Qualified Products List.

2.03 Waterborne Pavement Marking Paint

A. Waterborne pavement marking material in white and yellow colors shall conform to the current MDOT Specifications for waterborne pavement markings and shall be selected from MDOT's Qualified Products List.

2.04 Thermoplastic Pavement Markings

A. Hot applied thermoplastic pavement markings in white and yellow colors shall conform to AASHTO M249, white and yellow thermoplastic striping materials (solid form), shall meet the current MDOT Specifications for hot applied thermoplastic paving marking and shall be selected from MDOT's Qualified Products List.

2.05 Cold Plastic Pavement Markings

A. Preformed cold plastic pavement markers in white and yellow colors shall conform to the current MDOT Specifications for cold applied plastic pavement markings and shall be selected from MDOT's Qualified Products List.

2.06 Polyurethane Pavement Markings

A. Two-component, polyurethane pavement marking material in white and yellow colors shall conform to the current MDOT Specifications and shall be selected from MDOT's Qualified Products List.

2.07 Temporary Pavement Marking Tape

A. Temporary Pavement Markings Type R, and Type NR shall conform to MDOT Section 922.04.A and shall be selected from MDOT's Qualified Products list.

2.08 Glass Beads

A. Glass beads for reflectorizing white and yellow paint markings of pavement by the drop-in method on fresh paint stripes shall conform to the current MDOT Section 920.01 for glass beads for use in pavement markings for the type of paint specified.

Part 3 Execution

3.01 Verification of Existing Conditions

A. Prior to the placing of any pavement markings, examine the limits of the new Work and ascertain that the existing surfaces are adequate to receive the material to be installed.

3.02 Preparation of Surface

A. Surfaces to be painted must be thoroughly dry and free from dirt, loose paint, oil, grease, wax and other contaminants.

B. Costs incurred for removing and disposing of unsuitable materials in preparation of the surfaces to receive the new Work, shall be incidental to the price paid for the pavement markings.

3.03 Performance - General

A. Pavement marking operation shall be limited to the type of Work and the limits as specified on the Plans. If additional area is required by CONTRACTOR for storage of equipment or supplies, CONTRACTOR shall furnish ENGINEER with written permission obtained from the property owner of the storage area, permitting the storage.

B. Unless otherwise specified on the Plans or approved by ENGINEER, CONTRACTOR shall conduct his operations and use of his equipment in such a manner that traffic will be maintained throughout the Project.

C. For Work within public rights-of-way and other areas as determined by ENGINEER, the provisions for maintaining traffic shall be as specified in the Michigan Manual of Uniform Traffic Control Devices, and MDOT specifications for traveling convoys. Costs incurred in maintaining traffic shall be at CONTRACTOR's expense.

D. CONTRACTOR's equipment shall have sufficient paint capacity to enable sustained pavement marking operations and shall be equipped so as to assure uniform application of the paint and thermoplastic pavement markings.

1. Equipment shall have mechanical bead dispensers or pressurized bead dispensers. In general, the equipment shall be that necessary to accomplish the marking operations in a safe, efficient, and workmanlike manner.

2. For parking lots and other small areas, approved portable equipment and use of hand methods will be allowed.

E. The color of the paint, and the width or type of markings shall be as specified on the Plans or as directed by ENGINEER.

F. Markings shall be applied so that they adhere adequately to the surface.

G. Markings shall be applied in accordance with the applicable requirements of MDOT Section 811 for permanent pavement markings or Section 812.03 for temporary pavement markings. Unless otherwise specified, removal of temporary pavement markings shall be incidental to the Project.

3.04 Layout for Markings

A. Layout work necessary for the location and placing of markings, as specified on the Plans or as determined by ENGINEER, shall be the responsibility of CONTRACTOR and shall be at his expense.

3.05 Application of Waterborne Markings

A. Waterborne paint shall be applied when the air temperature is 50 degrees Fahrenheit or higher and the pavement is dry.

B. CONTRACTOR shall be responsible for making the decision to apply waterborne paint on any specific day when there is a high probability of rain in the forecast. If applied lines are washed away because of rain, CONTRACTOR shall be responsible for re-applying the lines at no additional expense to OWNER.

C. Waterborne pavement marking materials may be placed immediately on new bituminous pavement. Waterborne pavement marking material shall not be placed before May 1, or after October 1.

D. Waterborne paint shall be applied with an application thickness of 15-mil and 8-mil dry thickness. Glass beads shall be added at the rate of 32 pounds per mile per 4-inch line, during the application process.

3.06 Application of Pre-formed Hot-Applied Thermoplastic Markings

A. Since subsurface moisture can be present in amounts sufficient to affect proper bonding of the hot-applied thermoplastic material, CONTRACTOR shall be responsible for insuring that the pavement is free of excess moisture that may effect proper bonding prior to beginning work.

B. Testing for moisture shall be documented and provided to ENGINEER.

C. Minimum ambient air temperature shall be 48 degrees Fahrenheit and rising at the start of marking operations. If work is started and the air temperature falls below 45 degrees Fahrenheit, and continual cooling is indicated, all work shall be stopped. The minimum pavement temperature is 50 degrees Fahrenheit.

D. Thermoplastic material shall be heated and applied within the temperature range recommended by the manufacturer. Thermoplastic material shall not be placed before May 14, or after October 1.

3.07 Application of Polyurethane Pavement Markings

A. Polyurethane pavement markings shall not be applied over existing non-polyurea pavement markings. Existing non-polyurethane pavement marking shall be completely removed before applying polyurea pavement markings. Remove curing compounds from concrete pavement. Apply at 15 to 25-mil thickness. Pavement shall be clean and dry. Pavement temperature shall be 40 degrees Fahrenheit or higher unless otherwise approved by ENGINEER.

3.08 Tolerances

A. New markings and/or retraced markings shall be placed, with reasonable tolerance, in their proper locations.

B. Incorrect or misplaced markings shall be obliterated and remarked in accordance with ENGINEER's instructions. Costs incurred to obliterate and remark incorrect or misplaced markings will be at CONTRACTOR's expense.

3.09 Protection of Markings

A. Protection of the wet paint and thermoplastic pavement markings shall be the responsibility of CONTRACTOR, and all costs incurred to provide the protection will be at his expense.

3.10 Weather and Time Limitations

A. Markings shall not be placed when rain is threatening or when the surface to be painted is wet.

B. Pavement marking shall be performed during the period May 1 to November 1, unless otherwise approved in writing by ENGINEER. No markings shall be applied when the air temperature is less than 50 degrees Fahrenheit (10 degrees Celsius), as determined by ENGINEER.

End of Section

Section 32 3100
Fences and Gates

Part 1 General

1.01 Scope of Work

A. This Section includes the types of fencing work indicated on the Plans complete with layout of the Work, excavation and backfill, concrete foundation, fence framing and fabric, pickets and privacy slats, gates and hardware, and hardware adjustment and lubrication.

1.02 Related Work Specified Elsewhere

A. Section 31 2198: Site Construction Performance Requirements

1.03 Reference Standards

A. Unless otherwise specified, the Work of this Section shall conform to the applicable portions of the following Standards:

1. ASTM - ASTM International

2. AWPA - American Wood Preserves Association

3. FS - Federal Specifications

4. MDOT - Michigan Department of Transportation, Standard Specifications for Construction 2003

5. PS - U.S. Department of Commerce, National Bureau of Standards Product Standard

1.04 Submittals

A. Submit manufacturer's literature showing standard details of fence and gate materials.

B. Submit Shop Drawings showing details of fence and gate fabrication and installation.

Part 2 Products

2.01 General

A. Framing members for fence and gate framing shall be fabricated of the types and sizes of steel framing indicated on the Plans and as specified in this Section. As a minimum, framing members shall conform to the requirements in the Articles in Part 2 of this Section.

B. Tubular Sections shall be hot-dipped galvanized steel tubular materials conforming to ASTM A120 for weight and coating. Steel tubular framing may be welded or seamless steel pipe reasonably straight and free from injurious defect. Burrs at ends of pipe shall be removed. The average weight of the finished steel pipe shall not be less than 95% of the weight specified which shall include the weight of galvanizing.

C. Structural and roll-formed steel shapes conforming to ASTM A499, hot-dipped galvanized in accordance with ASTM A123. Framing members of structural and roll-formed shapes shall be fabricated of new rail steel billets, of the weights specified and galvanized. Weight of the zinc coating per square foot of actual surface shall average not less than 2.0 ounces (55 g) and no individual specimen shall show less than 1.8 ounces (50 g). Weight specified for structural and roll-formed shapes shall include the zinc coating, except that any weight of galvanizing over 4.0 ounces of zinc per square foot (lkg/m2) of surface shall be deducted from the weight.

2.02 Posts and Rails

A. Posts shall be round pipe or square rolled formed sections conforming to the dimensions and weights specified herein.

B. Round posts shall be hot dipped galvanized with a minimum average zinc coating of 1.8ft^2 (0.55 kg/m^2) O.D. meeting ASTM F1083 for standard weight (Schedule 40) galvanized pipe.

C. Rolled form sections shall be produced from steel having minimum yield strength of 45,000 psi (310 mPa) and meet the strength and protective coating requirements of ASTM F1043.

D. Intermediate Posts:

1. Intermediate posts shall be round or square conforming to the following weights and dimensions (O.D.):

a. For fabric 6.0 ft (1.83 m) or less:1.9 inches (48.3 mm) round weighing 2.72 lbs/ft (4.05 kg/m)

b. For fabric 7.0 to 10 ft (2.1 m to 3.0 m): 2.375 inches (60.0mm) round, weighing 3.65 lbs/ft (5.43 kg/m); or 2.0 inches (50.8 mm) square weighing 2.60 lbs/ft (3.87 kg/m).

c. For fabric over 10.0 ft (3.0 m): 2.875 inches (73 mm) round weighing 5.79 lbs/ft (8.62 kg/m); or 2.5 inches (63.5 mm) square weighing 5.10 lbs/ft (7.6 kg/m).

E. Terminal Posts, Angle Posts, Pull Posts and Brace Posts:

1. Round or square conforming to the following weights and dimensions (O.D.):

a. For fabric 6.0 ft (1.83 m) or less: 2.375 inches (60.0mm) round, weighing 3.65 lbs/ft (5.43 kg/m); or 2.0 inches (50.8 mm) square weighing 2.60 lbs/ft (3.87 kg/m).

b. For fabric 7.0 to 10 ft (2.1 m to 3.0 m): 2.875 inches (73 mm) round weighing 5.79 lbs/ft (8.62 kg/m); or 2.5 inches (63.5 mm) square weighing 5.10 lbs/ft (7.6 kg/m).

c. For fabric over 10.0 ft (3.0 m): 4.0 inches (101.6 mm) weighing 8.65 lbs/ft (12.88 kg/m); or 2.5" (63.5 mm) square weighing 5.10 lbs/ft (7.6 kg/m).

F. Gate Posts:

1. Gate posts shall be round or square conforming to the weights and dimensions (O.D.) in Table A.

G. Top Rail, Bottom Rail, and Middle Rail:

1. Round pipe: 1.66 inches (42 mm) weighing 2.27 pounds per linear foot (3.38 kglm).

2. Top rail lengths shall be not less than 18-feet (5.5m) and fitted with couplings or swedged for connecting the lengths into a continuous run. Couplings shall be not less than 6-inches (152.4 mm) long, with 0.070 inch (1.75 mm) minimum wall thickness and shall allow for expansion and contraction of the rail.

2.03 Bracing Truss

A. Diagonal truss: 318 inch (9.5 mm) nominal diameter rod with adjustable take-up.

2.04 Accessories

A. Post tops, extension arms, stretcher bars, rail ends and appurtenances shall be malleable iron or heavy pressed steel and galvanized in accordance with ASTM A153.

B. Post tops on fences with a top rail shall be provided with a hole suitable for passing the top rail through the post top and shall fit over the outside of the post with a weathertight closure.

C. Extension arms for supporting barbed wire shall be a single or "V" type as shown on the Plans, and extend from the top of the post at an angle of approximately 45 degrees. Arms shall be integral with post tops. Extension arms shall carry three (3) barbed wires equally spaced with the topmost wire approximately 12 inches (300 mm) above the fence fabric.

D. Stretcher bars shall be one piece lengths equal to the full height of the fence fabric. Bands shall be approximately 1-inch (25 mm) wide with beveled edges to secure stretcher bars to end, corner, pull and gate posts.

2.05 Woven Wire Fabric

A. Woven wire fabric shall be fabricated in accordance with the best commercial practices. The overall width of the fabric shall be not less than 46-1/2 inches (1.2 m). Fabric stays shall be uniformly spaced on 6-1/4 inch (160 mm) centers maximum.

B. Galvanized steel woven wire fabric shall conform to ASTM A116, No. 11 Farm Fencing, Design Number 1047-6-11, Grade 60, Class I, Zinc Coating.

C. Aluminum-coated steel woven wire fencing shall conform to ASTM A584, No. 11 Farm Fencing, Design Number 1047-6-11, Class I, Aluminum Coating.

2.06 Chain Link Fabric

A. Fabric shall be zinc (galvanized) coated, vinyl coated or aluminum coated. Zinc coated fabric shall be galvanized after weaving.

B. Unless otherwise indicated on the Plans or directed by ENGINEER, chain link fabric regardless of type, shall be 11 gauge (3.05 mm), zinc coated steel. Mesh shall be two (2) inches (50 mm). Fabric 72 inches (1830 mm) in height and over shall have both selvages knuckled. Fabric less than 72 inches (1830 mm**)** in height shall have the top selvage knuckled.

C. Zinc-Coated Steel Chain-Link Fence Fabric shall conform to ASTM A392, Class 2 Coating.

D. Aluminum-Coated Steel Chain-Link Fence Fabric shall conform to ASTM A491, and ASTM A817.

E. Vinyl-Coated Steel (Extruded Vinyl over Galvanized Steel Wire) Chain-Link Fence Fabric shall conform to ASTM F668, Class 2a.

F. Fused Vinyl-Coated Steel (Thermally Fused Vinyl Coating over Galvanized Steel Wire) Chain-Link Fence Fabric shall conform to ASTM F668, Class 2b.

2.07 Barbed Wire

A. Barbed wire shall be fabricated of 2-strand, 12-112 gage (2.50 mm) zinc-coated steel wire (Type Z, Class 3) with 4-point, 14-gage round barbs spaced on 5-inch (125 mm) centers conforming to Design Number 12-4-5-14R of ASTM A121. Wire shall be galvanized after fabrication.

2.08 Tension Wire

A. Tension wire shall be No. 7 gage (4.50 mm) ASTM A824 with a Type I aluminum coating, a Type 11, Class 2 zinc coating, or shall be hot dipped with a Type 11, Class 1 galvanized coating followed by a thermally fused vinyl coating. Tension wire shall have a minimum breaking strength of 1,950 pounds (8670 N).

2.09 Fabric Fasteners

A. Fasteners for securing fabric to framing members shall be No. 12 gage (2.68 mm) minimum, galvanized, aluminum coated or vinyl coated as compatible with fabric.

B. Hog rings shall be 11-gage (3.05 mm) minimum galvanized, aluminum or vinyl coated as compatible with fabric.

C. Coatings for fasteners shall conform to the requirements of ASTM A641, Class 111.

2.10 Wood Posts

A. Wood posts will only be acceptable when woven wire fencing is specified on the plans or in the Proposal. Wood posts shall be Cedar, Red Oak, White Oak, Beech, Hard Maple, White Ash, Yellow Birch, Norway Pine, Northern White Pine or other species acceptable to ENGINEER.

B. Posts shall have been cut from timber seasoned by stacking in a manner acceptable by ENGINEER.

C. Timber as a minimum shall be equal to No. 3 Grade Southern Pine.

2.11 Wood Framing, Pickets, and Gates

A. Framing pickets and gates used in woven wire fencing shall conform to the requirements of U.S. Department of Commerce Standard for Softwood Lumber (PS 20) for the specific application as described in ASTM F537. Wood bracing shall be either Cedar Oak or other approved wood poles not less than 4-112 inches (115 mm) in diameter.

2.12 Wood Preservatives

A. Applicable requirements of ASTM D1760, Method D shall apply for all preservative pressure treated wood fencing materials.

B. Brush coated treatment of wood fencing materials shall conform to the applicable portions of AWPA Standard M4.

C. Oil-born treatment of wood fencing materials is not acceptable.

2.13 Metal Fasteners for Woven Wire Fencing

A. Metal fasteners used in the construction and installation of woven wire fencing shall be corrosive-resistant type conforming to ASTM F537 unless otherwise indicated on the Plans. Staples shall be No. 9 gage (3.75 mm) steel wire, 1-1/2 inch (40 mm) minimum for softwood and 1-inch (25 mm) minimum for hardwood.

2.14 Privacy Slats

A. Privacy slats where shown shall be of type and sizes indicated on the Plans.

B. Wood for privacy slats shall be graded and finished as recommended by the California Redwood Association for landscaping wood.

2.15 Concrete

A. In accordance with MDOT Section 601, use Grade P2; 3,000 psi (21 MPa) strength; Type IA cement; 5.5 sacks cement per cubic yard (306 kg/m3); 6A coarse aggregate; 2NS fine aggregate; 6.5% ± 1.5% air content; 4-inch (100 mm)maximum slump; no admixtures without the ENGINEER'S approval.

2.16 Gates

A. Frames for gates shall be fabricated of Zinc-coated steel frames in accordance with ASTM F1043.

B. Welded joints shall be coated in accordance with Practice A780, employing zinc rich primer. Gates shall be provided with intermediate braces and truss rods of sufficient strength to form a rigid frame without twist or sag. Members shall not sag in excess of the lesser of 1% of the gate leaf width or 2-inches (50 mm).

C. Gate frame members shall be in accordance with Table B, minimum.

D. Fabric used for gates shall be the same as that used for fencing unless otherwise indicated on the Plans. Install fabric with stretcher bars at vertical edges, and tie wires at top and bottom edges.

E. Install stretcher bars to gate frame at not more than 15-inch (300 mm) centers. Attach hardware with approved fasteners that will provide security against removal or breakage.

F. Hinges shall be non-lift-off type, offset to permit 180-degree gate opening. Hinges shall be structurally capable of supporting the gate leaf and allow the gate to open and close without binding. The hinges shall be so designed to permit the gate to swing a full 180 degrees.

G. Latch shall be forked or plunger bar type with integral padlock eye and shall be operable from either side of gate.

H. Keeper, where required, shall automatically engage the gate leaf and hold it in the open position until manually released. Keepers shall be provided on each gate leaf over 5-ft. (1.5 m) wide.

I. Double gates shall be provided with mushroom type or flat plate gate stops and anchors. Stops shall be designed to engage the center drop rod or plunger bar of both leaves.

J. Sliding gates shall comply with ASTM F1184. Slide gates shall be horizontal slide gates supported only from above or cantilever slide gates spanning an opening without a top or bottom support as indicated on the plans. Cantilever slide gates shall be supplied with zinc coated steel frames using external or internal rollers per ASTM F1184.

Part 3 Execution

3.01 Final Grading

A. Verify that final grading in the area to receive fencing has been completed. Grades shall be without irregularities that would interfere with the fence installation. Report all discrepancies in final grades that would interfere with the new Work to ENGINEER. Do not commence Work until all unsatisfactory conditions have been corrected.

3.02 Measurement and Layout

A. Measure and layout the complete fence line as indicated on the Plans. Measurements for installation of fence work shall be measured parallel to the surface of the ground.

B. Do all locating and marking of fencing post positions. Locate line posts at equal spacings, center to center, as indicated on the Plans and specified in this Section. Locate and mark corner post positions at changes in fencing runs exceeding 30 degrees.

3.03 Installation - General

A. Installation of fencing and gates shall meet the requirements of ASTM F567and Chain Link Manufacturers Institute, Product Manual CLF 2445.

B. Work shall be installed in accordance with the best trade practices, to the best workmanship and in a manner acceptable to ENGINEER.

C. Finished fence shall be plumb, taut, true to line and ground contour and rigidly secured in position.

3.04 Installation of Woven Wire Fence

A. Line posts shall be spaced not more than 16'-6" (5 m) center to center. Line posts adjacent to any end, corner, gate or intermediate braced post shall be spaced not more than ten (10) feet (3 m), center-to-center.

B. Posts shall be set in holes dug minimum depth of 4'-6" (1.5 m) except that a tolerance of three (3) (75 mm) inches is permitted provided the exposed portion of the post will not be less than 4'-4" (1.1 m). Posts shall be set with large end down, plumb on side to receive fabric.

C. Angle posts shall be installed where a deflection in fence alignment exceeds 30 degrees. Install intersection posts in line of intersecting fencing runs. Intersecting runs of fence shall be connected to a common post.

D. Metal posts shall be driven with a suitable driver acceptable to ENGINEER. Metal posts shall be driven to the proper depth, plumb and in conformity with fence lines indicated on the Plans. Metal posts which are bent or otherwise damaged during driving shall be removed and replaced.

E. End, corner, gate, angle, intersection and intermediate braced posts shall be set in concrete at least 18 inches (450 mm) in diameter and 4'-6" (1.5 m) deep. Braces shall be set in concrete at least 18 inches (450 mm) in diameter and 18 inches (450 mm) deep. Corner, angle and intermediate braced posts shall be braced in both directions. Intersection posts shall be braced in three (3) directions. Braces shall be securely fastened to the post near the top. At grade depressions and alignment angles, line posts shall be set in concrete at least 18 inches (450 mm) in diameter and 4'-6" (1.5 m) deep.

F. Woven wire fabric shall be installed to the lines and levels indicated on the Plans. Fabric shall be stretched taut and securely fastened to each post with the bottom of the fabric approximately two (2) inches (50 mm) above the ground. Each horizontal strand of wire shall be wrapped completely around the end, corner, gate, intermediate braced or angle post and securely fastened by winding the end about the wire where it leads up to the post. Line posts shall not be used as a stretching anchorage.

G. Splicing of wire in woven wire fabric and barbed wire shall be accomplished in a manner which will develop the full strength of the wire. Distance between the vertical stays adjacent to the splice shall be the same as for the unspliced sections of the fabric. One (1) approved splice may be placed at the end of the roll of fence without regard to the distance from a post.

H. Fabric shall be securely fastened to each metal post with at least six (6) wire clamps.

I. Fabric shall be attached to each wood post by at least one (1) fastener for each horizontal stand and as many other fasteners as required to secure wire firmly to post.

J. Fabric shall be topped with barbed wire as indicated on the Plans. Barbed wire shall be securely fastened to each post.

K. Gates shall be erected using methods acceptable to ENGINEER in the locations shown on the Plans.

3.05 Installation of Chain Link Fence

A. Posts for chain link fence shall be set and braced as indicated on the Plans, as specified herein, or if not indicated, installation shall meet the requirements of ASTM F567 and Chain Link Manufacturers Institute, Product Manual CLF 2445.

B. Line posts shall be spaced not more than ten (10) feet (3 m) center-to-center. Angle posts shall be installed where a deflection of ten (10) degrees or more occurs in fence alignment.

C. Intermediate, braced posts shall be spaced at 660-foot (200 m) intervals or midway between end posts, angle posts or corner posts when this distance is less than 1,320 feet (400 m) but more than 660 feet (200 m).

D. Intersection (corner) posts shall be set in line with intersecting fences. Both intersecting fences shall be connected to the common post.

E. Posts shall be set in concrete. Depth of concrete footings for line posts shall be not less than 3'-6" (1 m). Footing diameters shall be nine (9) inches (225 mm) minimum for line posts. Footing diameters for end, corner, angle, intersection, gate and intermediate braced posts shall be 18 inches (450 mm) minimum. Holes for post foundations shall be completely filled with concrete around post.

F. Fences shall have at least a top rail and a bottom tension wire. Fences 10-feet or more in height, and where otherwise indicated on the plans, shall have center and bottom rails. Bottom and center rails shall be securely connected to posts by means of connections approved by ENGINEER.

G. Top rail shall pass through the line post tops to form a continuous brace from end to end of each stretch of fence fabric. Splice joints shall be provided as indicated on the Plan. Suitable ties or clips shall be provided for attaching the fabric securely to the top rail at intervals not exceeding 24-inches (610 mm).

H. Top, center and bottom rail shall be secured to gate, corner, pull, end and line posts as indicated on the Plans.

I. Horizontal braces of fencing six (6) feet (1830 mm**)** high and over shall be securely fastened to end, corner, angle, intersection, gate, and intermediate braced posts by means of suitable metal connections. Braces shall be positioned midway between top rail and ground and shall extend to the first line posts. Braces shall be trussed as indicated on the Plans.

J. Posts shall be fitted with post tops.

K. Install chain link fabric of height indicated on plans. Fabric shall be pulled taunt and tied to posts, rails and tension wires. Fabric shall be secured to framing by means of suitable metal bands, hogs or clips. Fasteners shall be spaced not more than 12 inches (300 mm) apart on posts and not more than 15 inches (375 mm) apart on top rail. Hogs rings for connecting fabric to tension wire shall be spaced on not more than 24-inch (600 mm) centers.

L. Install extension arms as indicated on the Plans.

M. Intermediate extension arms shall have hole for passage of top rail. Extension arm shall carry three (3) barbed wires equally spaced with the topmost barbed wire approximately 12 inches (300 mm) in or out from the fence line.

N. Provide one (1) stretcher bar for each gate and end post; provide two (2) stretcher bars for each center and pull post. Thread bars through fabric and secure to post with metal bands on 15-inch (375 mm) centers maximum.

O. Fasten tie wires where shown and as required.

P. Use U-shaped clips of wire securely fastened around pipe for clasping pipe and fabric. Bend ends of tie wire to minimize hazard to personnel and clothing.

Q. Install gates of types and sizes and in locations indicated on the Plans.

1. Install ground-set items in concrete for anchorage as recommended by the manufacturer of the chain link fence.

2. Lower hinge of gate shall be placed on top of concrete footing in which gate post is set.

3. Footing concrete shall extend up to the bottom of the lower hinge.

4. Cone bolt sockets for double swing gates shall be set in concrete so that plunger pin fits in socket when gate is in closed position.

5. Gates shall be erected to swing in direction indicated.

6. Install gate stops to limit swing as shown on Plans.

7. Gates shall be hung plumb, level and secure for full opening without interference.

R. Privacy slats, where used, shall be of types and sizes indicated on the Plans.

1. Slats shall be secured to fabric using suitable clinch-lock type fasteners acceptable to ENGINEER.

2. Slats shall be secured to fabric by suitable metal fasteners on 6-inch (150 mm) vertical centers.

3.06 Adjustment and Post Leveling

A. After erection of fence, adjust gate hardware for smooth and positive operation.
B. After erection of fences, the tops of wood posts shall be cut off to proper elevation.

3.07 Lubrication

A. After completion of fence erection, lubricate moving parts of gate hardware to insure smooth operation without binding.

Table A. Dimension and Weight of Gate Posts

Gate Leaf Width feet (m)	Outside Dimension inches (mm)	Min Weight lbs/ft (kg/m)
For fabric Ht. 6.0 ft (1.8 m) or less		
4.0' (1.2 m) or less -round	2.375" (60.3)	3.65 (5.43)
-square	2.00" (50.8 mm)	2.60 (3.87)
Over 4'to 10' (1.2 m to 3.7m)-round	2.875" (73.0)	5.79 (8.62)
-square	2.50" (63.5)	5.10 (7.60)
Over 10'to 18' (3.7 m to 5.5m) - round	4.00" (101.6)	8.65 (12.88)
-square	2.50" (63.5)	5.10 (7.60)
For fabric Ht. over 6.0 ft (1.8 m)		
6.0' (1.2 m) or less -round	2.875" (73.0)	5.79 (8.62)
-square	2.50" (63.5)	5.10 (7.60)
Over 6'to 12' (1.2 m to 3.7m)-round	4.00" (101.6)	8.65 (12.88)
-square	2.50" (63.5)	5.10 (7.60)
Over 12'to 18' (3.7 m to 5.5 m) -round	6.625" (168.3)	18.02(26.82)
Over 18'to 24'-round	8.625 (219.1)	27.12 (40.36)

Table B. Gate Frame Members, Dimensions and Weights

Gate Leaf Width feet (m)	Outside Dimension Inches (mm)	Min Weight lbs/ft (kg/m)
For fabric Ht. 6.0 ft (1.8 m) or less		
Round tubular steel	1.66" (42.2)	1.83 (2.72)
Rectangular tubular steel	1.5" (38.1)	1.84 (2.74)
For fabric Ht. over 6.0 ft (1.8 m)		
Round tubular steel	1.90” (48.3)	2.28 (3.39)
Rectangular tubular steel	2.00” (50.8)	2.52 (3.75)
Interior Bracing		
Round tubular steel	1.66” (42.2)	1.83 (2.72)
Rectangular tubular steel	1.50” (38.1)	1.84 (2.74)

End of Section

Section 32 9000
Planting

Part 1 General

1.01 Scope of Work

A. This Section includes furnishing trees, shrubs and ground cover as shown on the Plans, complete with the digging and preparation of holes, furnishing and placing of topsoil, planting, pruning, watering, fertilizing and cultivating; weed control fabric, and such other materials necessary to complete the Work and insure proper and hardy growth.

1.02 Related Work Specified Elsewhere

A. Section 31 2198: Site Construction Performance Requirements:

1.03 Source Quality Control

A. Trees, shrubs and ground cover shall comply with the state and federal laws with respect to inspection for plant diseases and insect infestation.

1.04 Reference Standards

A. AAN - American Association of Nurserymen

B. AANLS - American Association of Nurserymen Landscape Standards

C. ANSI - American National Standards Institute

D. ASTM - American Society for Testing and Materials

E. MDOT - Michigan Department of Transportation Standard Specifications for Construction, 2003

1.05 Submittals

A. CONTRACTOR shall submit to ENGINEER certificates of inspection for plant diseases and insect infestation.

B. Submit a certified analysis of imported topsoil from each off-site source prior to delivery. Deficiencies shall be corrected at CONTRACTOR's expense.

C. Submit sample of mulch and planting mixture prior to delivery to site.

D. Submit product data for anti-desiccants, tree wound dressing and herbicides prior to use.

1.06 Plant Selection and Inspection

A. Trees shall be inspected and accepted prior to planting. CONTRACTOR may elect either of the following options as applicable:

B. For sources within 120 miles of the site, ENGINEER will tag the trees at the source. CONTRACTOR shall request, in writing, at least two weeks prior to any desired inspection date, inspection and approval of the trees at the source. Approved trees will be tagged by ENGINEER and the tag shall remain on the tree until planting and final inspection. CONTRACTOR shall accompany ENGINEER on the inspection.

C. Otherwise, the trees will be delivered to the site. Trees approved for use will be tagged by ENGINEER and the tag shall remain on the tree until planting and final inspection. Rejected trees will not be tagged and shall be immediately removed from the site, and new trees shall be brought in for inspection and approval.

D. Plant material shall be subject to approval by ENGINEER at the site prior to planting.

1.07 Preparation of Shipments

A. Plant material shall be clearly labeled as to species and variety. The label or tag shall be securely attached to each plant and shall show the scientific name of the plant. Unless otherwise shown on the Plans, all plants shall be balled and burlapped or container grown.

B. In preparation for spring planting, balling operations for balled and burlapped stock shall be completed prior to "bud break." In preparation for fall planting of deciduous plants, balling operations shall not commence until after the plants have begun to "harden off." Stock shall be dug and packed with care immediately prior to shipment. Plants shall be dug and transported so as to provide and retain a firm ball of earth. Roots shall be carefully protected with wet straw, moss or other material. Root balls shall be adequately protected from rain or sudden changes in the weather. Balled and burlapped plants will not be accepted if the balls of earth are loosened or broken, or wrapped with material made from synthetics or plastic.

C. Plants furnished in containers shall have their roots well established in the soil mass and shall have grown in the container for at least one (1) growing season. Containers shall be of a size large enough to provide an earth-root mass of adequate diameter and depth for the stem diameter and plant height or spread, as established by accepted nursery practice. No container grown stock will be accepted if it is root bound.

D. Transporting of all nursery stock shall be in an enclosed or covered vehicle. Deliver plant material immediately prior to planting. Keep plant material moist.

E. Plants will be rejected when the ball of earth surrounding the roots has been cracked or broken prior to or during the planting.

F. Plants shall be rejected when the burlap, stakes, or ropes required in connection with transplanting have been displaced prior to final acceptance.

1.08 Storage and Handling

A. Roots of plants shall be kept moist and adequately protected by topsoil or other approved covering until planted.

B. Trunks and branches of trees shall be carefully protected from injury of any kind during all operations of digging, loading, transporting and planting. Trees that are injured may be rejected.

1.09 Planting Season

A. Planting seasons for deciduous plants shall be between March 1 and June 1 and from October 1 until the ground becomes frozen, except that, when unusual planting conditions exist or when container-grown material is used, these planting seasons may be altered. When approved by ENGINEER, plants, having a ball of earth attached, may be planted during the summer months, provided adequate moisture will and can be applied to the plants.

B. Planting season for evergreen plants shall be between March 1 and June 1.

1.10 Guarantee and Acceptance

A. CONTRACTOR shall warrant that all trees have been grown, transported, handled and planted properly so as to be in a vigorous growing condition at the start of the establishment period.

B. Trees, shrubs and ground cover shall be guaranteed for the establishment period(s). CONTRACTOR shall replace all trees, shrubs and ground cover showing defective growth, more than 20% dieback, disease, insect infestation or other impairing defects during the Establishment Period with sound, healthy, vigorous growing trees, shrubs and ground cover at no additional expense to OWNER and in accordance with the plans and specifications.

C. At the end of the Establishment Period, CONTRACTOR shall request final acceptance. Final acceptance will be made by ENGINEER and OWNER provided the trees are healthy and all requirements of the Project have been fulfilled.

1.11 Experience and Qualifications

A. CONTRACTOR or Subcontractor must be experienced and capable of completing the Work so that the plant materials are in a healthy, vigorous growing condition at the end of the Project. In order to show that CONTRACTOR or Subcontractor is capable of completing the Work in successfully, when requested by ENGINEER, CONTRACTOR shall submit references from the last five (5) projects of a similar nature. Failure to show successful completion of the last five projects of a similar nature may result in CONTRACTOR or Subcontractor being deemed unacceptable for this Work on this Project.

Part 2 Products

2.01 Trees and Shrubs

A. Trees and shrubs shall conform to the requirements of AANLS and as specified herein.

B. Plant material shall conform to the sizes given in the plant list or Proposal. Measurements such as spread, ball size, number of canes, quality designations, etc. shall be in accordance with AAN “American Standard for Nursery Stock”.

C. Plant material shall be typical for their species or variety and shall be sound, healthy, vigorous, and free from plant diseases and insect pests or their eggs. They shall have healthy, well developed root systems.

D. Plants designated “B&B” shall be balled and burlapped. They shall be dug with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Balls shall be securely wrapped with burlap and bound with cord.

No balled and burlapped plant shall be planted if the ball is cracked or broken. No planting with rot proof burlap or ties shall be permitted. Sand balls are not acceptable.

E. Trees shall be nursery grown stock which has been pruned to encourage single main stems, compact fibrous root systems and symmetrical branching. Trees of the same species shall be uniform in height and spread. Trees shall be free from all insects, diseases, mechanical injuries or other objectionable features. Root balls shall be of the sizes specified in AANLS for the tree root system.

F. Container-grown stock shall have been grown in the containers for one (1) growing season minimum. Plants showing "Pot Bound" root ends will not be accepted.

G. Trees caliper for trees less than 4-inch (100 mm) caliper shall be determined at a point six (6) inches (150mm) above ground when installed. Trees above 4-inch (100 mm) caliper shall be measured at a point twelve (12) inches (300 mm) above the ground.

H. Ornamental trees and shrubs shall be well formed and shall have a crown typical of the species or variety. Low-branched crown types shall be furnished, unless the Plans or Proposal specify a tree form or a bush form. Material shall be balled and burlapped, unless otherwise indicated. Plant stock shall have grown to the required size in a normal progressive manner. Heading-back plants to meet sizes called for on the Plans will not be permitted.

I. Evergreen trees will require ball and burlap or other adequate root protection. Tops shall be of a form typical to the species and not unnaturally sheared or color treated. Anti-desiccant protection may be required for evergreen trees.

J. Plant material shall be nursery grown at sources in the same or higher hardiness zone as determined by the latest edition of the Plant Hardiness Zone Map, Agricultural Research Service, U.S. Department of Agriculture.

K. Substitutions will be permitted only upon submission of proof that specified plants are not obtainable and with the authorization of ENGINEER. Requests for substitutions and price adjustments due to substitutions must be submitted in accordance with the General Conditions.

2.02 Mulching

A. Mulching material shall be one of the following as specified on the plans.

1. Compost:

a. Compost shall be mature/stabilized, humus-like material derived from the aerobic decomposition of yard waste (i.e., grass clippings and leaves) or other materials as designated compostable as defined in P.A. 641 as amended and shall be in compliance with all federal and state laws. The compost shall have a dark brown or black color, be capable of supporting plant growth without ongoing addition of fertilizers or other soil amendments and shall not have objectionable odor. The mixture shall be free of glass, plastic, metal, and other contaminants, as well as viable weed seeds and other plant parts capable of reproducing. The mixture shall be such that no visible water or dust is produced when handling it.

b. Manufacturer of the compost shall maintain annually on file with the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division, test data and a statement to show that the following criteria are being met by the compost provided for the project.

c. The composition of the compost shall be within the following range of values:

(1)	Soil pH	6 to 7.5
(2)	Soluble Salts	2 to 5 mmho/cm
(3)	Carbon/Nitrogen Ratio	13 to 20 parts C to 1 part N
(4)	Inerts	< 1%
(5)	Organic matter	35 to 55 %
(6)	Nitrogen	1 to 2 %
(7)	Phosphorus	0.2 to 0.8 %
(8)	Potassium	y0.5 to 1.5 %
(9)	Unit Weight	535 to 775 Kg/m3
(10)	Moisture Content	40 to 50 %
(11)	Particle Size	< 20 mm maximum
(12)	Water Holding Capacity	> 100%
(13)	Heavy Metals	None

d. Maturity/Stabilization: An acceptable test that can demonstrate Maturity/Stability.

e. Temperature: The compost material must have undergone the procedure to significantly reduce the pathogen level as referenced in EPA 40 CFR, Part 257 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations. The temperature must be maintained at 40° C for 5 days with a temperature exceeding 55° C for at least 4 hours.

f. Pathogens and Trace Elements: Shall meet the requirements of EPA 40 CFR; Part 503 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations.

g. To comply with the annual filing requirements with the Michigan Department of Agriculture, Pesticide and Plant Management Division, the supplier of the compost shall certify that the compost meets Michigan P.A. 641 as amended and EPA 40 CFR, Part 257 and 503 Regulations, Federal Register Vol. 58, No. 32; dated 2/19/93; Rules and Regulations.

h. A data sheet shall accompany the certification. The data sheet shall show the following:

(1) Standard compost total nutrient test results, including N, P, K, Ca, Mg, Mn, Cu, Fe total carbon, pH, as provided by an acceptable testing laboratory

(2) Organic content

(3) Inert contamination

(4) Soluble salts

(5) Carbon/Nitrogen ratio

(6) Proof of maturity/stability acceptable to the Michigan Department of Agriculture

i. The certification and data sheets shall be mailed annually to the Michigan Department of Agriculture, Agriculture Environment Coordinator. The date shall be included on which the compost test results were mailed to the Michigan Department of Agriculture.

2. Wood Chips:

a. Wood chips shall be the product of a mechanical chipper.

b. Chips shall not include twigs, chopped leaves, or pine needles. Suitability of chip material and size will be determined by visual inspection by ENGINEER.

c. Wood chips shall be produced from trees free of any insects and diseases.

3. Shredded Bark:

a. Shredded bark shall consist of tree bark which has been stripped and shredded from saw logs by means of a debarking machine.

b. Shredded bark shall be produced from trees free of any insect and diseases.

c. Material shall be sufficiently fine and free from extraneous material so that it will readily pass through a conventional mulch blower.

4. Double Shredded Bark:

a. Double processed shredded bark mulch shall be shredded bark mulch which has been processed twice.

2.03 Topsoil

A. Topsoil shall be fertile, friable, sandy clay loam without admixture of subsoil. Topsoil is to be free of glass, stones greater than one (1) inch (25 mm) in any dimension, weeds, undesirable grasses and other extraneous materials. Topsoil shall have the following range of values:

1. pH ..... 5.0 to 7.5
2. soluble salts ..... 500 ppm max
3. organic content ..... 5% to 30%
4. silt content ..... 35% to 50%
5. clay content ..... 5% to 10%
6. deleterious mat'l* ..... 5% max

*rock, gravel, stone, sticks, roots, sod, etc.

B. Compost may be mixed with topsoil to obtain the desired content. Topsoil is to be final screened thru a 5/8-inch (15 mm) maximum mesh screen prior to delivery to the Project site. ENGINEER shall review source and final screen results prior to release of topsoil. CONTRACTOR shall submit a certified analysis of the topsoil from each source to ENGINEER. Topsoil shall be placed in 4-inch (100 mm) minimum thickness throughout, or as specified in the plans or Specifications.

C. CONTRACTOR shall obtain his own topsoil borrow pit source and shall obtain all necessary permits and agreements for the use of such borrow pits at his own expense.

2.04 Sand

A. Sand for planting mixture shall be clean, course, ungraded sand conforming to ASTM C3 for fine aggregates.

2.05 Fertilizer

A. Fertilizer shall be Agriform 21-Gram Planting Tablets Plus Minors, or ENGINEER-approved equal. Planting Tablets shall be tightly compressed, long-lasting and slow-release with an N-P-K analysis of 20-10-5. Apply at manufacturer's recommendations and soil analysis.

2.06 Peat

A. Granulated raw Canadian peat or baled Canadian peat, containing not more than 9% mineral on a dry basis. For ericaceous plants, baled peat with a pH of 4.0 shall be used.

2.07 Landscape Weed Control Fabric

A. Weed barrier fabric shall consist of a geotextile fabric, spun-bonded polypropylene, non-woven fabric and a UV stabilizer.

Minimum Average Roll Values

Fabric Properties	Minimum Values	Test Method
Unit Weight	3.0 oz/yd2	ASTM D5261
Grab Tensile Strength	135 lbs.	ASTM D4632
Elongation at Break	70%	ASTM D4632
Puncture Strength	35 lbs.	ASTM D4833
Trapezoidal Tear	50 lbs.	ASTM D4533
Permittivity	1.2 sec.-1	ASTM D4491
Air Opening Size (equivalent Sieve)	60/70	ASTM D4751
Ultraviolet Stability	70% @ 500 hrs.	ASTM D4355

B. Fabric shall be Typar Professional Landscape Fabric 3301 or ENGINEER approved equal.

2.08 Steel Landscape Edging

A. Comply with ASTM A 569, hot-rolled, standard flexible carbon steel landscape edging, fabricated in sections with stake pockets stamped, punched, or welded to face of sections approximately thirty inches (30") apart to receive stakes. Steel landscape edging shall be double staked at overlap joints, and designed to receive tapered steel stakes.

B. Steel Edge shall be 12ga (.10"-105") x 4" wide, by 10' length, with 4 stakes. Painted finish shall be Sherwin Williams H68GT85 powder coat paint electrostatically applied and oven baked. Minimum thickness to be 1.5 mils. Color shall be green, brown, or black as determined by OWNER.

C. Steel stakes shall be Steel, tapered, 14" length and finished to match specified steel landscape edging. Stakes shall be designed specifically to anchor steel landscape edging in place, and made by the manufacturer of the steel landscape edging for which they will be used.

D. Furnish and install manufacturer's standard start/end sections, 90° corners, and splicers as required.

2.09 Stakes for Guying and Bracing

A. Stakes used for bracing or guying plants shall be sound wood of nominal 2" x 2" (50 mm x 50 mm) stock and shall be approximately 30 inches (750 mm) in length for guying or of the required length for bracing. The stakes shall be pointed on one end by beveling on two (2) sides.

B. Metal stakes for bracing trees shall be green metal T-section posts with no anchor plates. Posts shall be at least 8 feet (2.5 m) long. Posts shall only be used where specified on the plans.

2.10 Wire for Guying and Bracing

A. Wire shall be new and free from bends or kinks.

B. Wire used for guying trees four (4) inches (100 mm) or less in diameter shall be No. 11 steel wire.

C. Wire used for guying trees over four (4) inches (100 mm) in diameter shall be No. 9 galvanized steel wire.

2.11 Hose

A. Hose used with wire for guying trees shall be new 1/2-inch (10 mm) reinforced rubber garden hose or steam hose.

2.12 Plastic Guying and Bracing Material

A. High density polyethylene, chain-lock type material, 1-inch (25 mm) wide with a breaking strength of 100 lbs minimum.

B. Flat, woven, webbing type 3/4-inch (20 mm) wide tape constructed of polypropylene with a breaking strength of 900 lbs in either white or olive green.

2.13 Tree Balling Burlap

A. Balling material shall be untreated burlap or other material which will readily decompose. Synthetic materials such as nylon or plastic will not be permitted.

2.14 Planting Mixture

A. Planting mixture shall be a mixture of 1/3 topsoil, 1/3 sand, and 1/3 compost. Add fertilizer at the quantity as recommended by the manufacturer. Planting mixture shall be free from stick, stones, sod clods or other material which might leave pockets around the roots.

2.15 Acceptable Manufacturers

A. Plastic guying and bracing material shall be Adj-A-Tye heavy duty poly chain lock by A. M. Leonard Inc., ArborTape by Neptco Inc. or ENGINEER-approved equal.

Part 3 Execution

3.01 Contractor's Verification

A. CONTRACTOR shall stake all plant locations and confirm the locations and type of plants to be placed with ENGINEER. Inspect trees, shrubs and ground cover for injury, insect infestation and improper pruning. Verify that all trees, shrubs, and ground cover are in healthy growing condition.

3.02 Preparation

A. CONTRACTOR shall not begin excavation until stake out of tree and/or shrub locations are acceptable to ENGINEER.

B. CONTRACTOR shall stake enough planting locations for two weeks work. CONTRACTOR shall arrange periodic site meetings with ENGINEER for the purpose of reviewing the work that has taken place in the prior two weeks and the staking for the next two weeks. CONTRACTOR shall notify ENGINEER at least three working days prior to the desired date for inspection of staking.

C. CONTRACTOR shall accurately stake plant material location according to the plans. Stakes for trees shall be 36” high above finished grade and painted a bright color to be clearly visible for inspection. Distinguish by color between types of material, i.e., evergreen trees, canopy trees, flowering trees. Staking for shrubs, perennials, and ground covers shall be staked 18” high above finished grade and painted white. Stakes shall be placed at the perimeter and at the bed line 30 feet on center. ENGINEER shall review the locations and make changes in locations as necessary.

3.03 Planting

A. Balled and burlapped plants shall be set plumb. Tree pits shall be excavated as shown on the plans. CONTRACTOR shall dispose of subsoil dug from pits, trenches and beds.

B. CONTRACTOR is responsible for planting to correct grades and alignment and all plants shall be set so that, when settled, they will bear the same relation to finish grade as they did before being transplanted. No filling will be permitted around trunks or stems.

C. At the start of the Work tree pits and beds are to be excavated and CONTRACTOR shall request inspection and approval by ENGINEER. Approval must be received before backfilling occurs.

D. Root ball shall be set on a compacted base as detailed. Burlap shall be cut away from top 1/3 of the root ball and all ropes, wires, etc. securing the ball shall be removed.

E. Plastic tape and/or plastic fabric shall be completely removed from the root ball during the planting operation. "Rot proof" or treated burlap shall also be totally removed.

F. Container-grown plants shall be planted as specified for balled and burlapped stock, except that when plants are furnished in nonplantable containers, the container shall be removed only at the time of planting. Plants furnished in plantable type containers shall have container sides severed in multiple places and the upper half of the container removed during the planting operation. Care shall be taken to protect tree roots during severing and removal operation.

G. When the plant has been properly set, the pit shall be backfilled with planting mixture, gradually filling, tamping and settling with water. No soil in a frozen or muddy condition shall be used for backfilling. Backfill shall be placed to an elevation flush with the ground elevation and the rootball, except that a saucer shall be created near the edge of the hole to capture water.

H. During fall planting, an ENGINEER-approved superphosphate fertilizer shall be applied over the planting mixture at a rate per the manufacturer's instructions.

I. Evergreen plant material shall be sprayed with an ENGINEER-approved anti-desiccant according to manufacturer's instructions and limitations immediately following planting and during final seasonal watering.

3.04 Mulching

A. After backfilling is completed, mulching material shall be placed over the plant hole area to a depth of five (5) to six (6) inches (125 - 150 mm)or as specified on the plans. Thoroughly soak mulched areas. After watering, mulched areas shall be raked and left in a complete and finished manner.

B. Perennial areas shall have 3 inches (75 mm) of mulch or as specified on the plans. Mulch these areas first and then plant ground cover through the mulch.

C. Planting beds shall be mulched with a 4 inch (100 mm) cover of mulch as shown on the drawings and details, unless otherwise indicated on the drawings. Mulch depths shall be 4 inches (100 mm) at time of inspection.

D. For plants located on slopes, an earth saucer or berm shall be constructed halfway around each plant on the down slope side. The saucer or berm shall have an inside diameter equal to that of the planting hole, and a maximum height of six (6) inches (150 mm). A trench shall be dug on the down slope side and filled with planting mixture to allow for drainage.

3.05 Bracing and Guying

A. Only evergreen trees equal to or larger than 5-feet (1.5 m) high and deciduous trees with a caliper equal to or larger than 2-inches (50 mm) need to be staked or guyed unless clay soil conditions exist, a tree is planted on a steep slope, or otherwise becomes apparent that a tree needs to be braced or guyed. Trees required to be braced, shall be braced or guyed immediately after planting.

B. Plants required to be braced shall be braced with a minimum of two (2) stakes.

C. Stakes shall be driven to avoid ball and shall be not closer than 1-foot (300 mm) from the trunk.

D. Stakes shall be driven to a depth which will firmly anchor the plant, but in no case less than 12 inches (300 mm) below the bottom of the planting hole.

E. The wide side of the stake shall face the trunk of the plant.

F. Stakes shall extend to within four (4) inches (100 mm) of the lowest plant's main branches.

G. Top of stake shall be firmly attached to the trunk with steel wire or plastic guying and bracing material.

H. When using steel wire, place wire so it forms a figure eight (8) around the stake and trunk. Portions of wire around trunk shall be encased in water hose of sufficient length to contain the wire loop around the trunk. Enclosed trunk loops shall not restrict normal trunk growth. Stakes shall be positioned on opposite sides of trunks and secured to the trunk at approximately 2/3 the height of plant. Warning tape or ribbon shall be tied to the wiring between the tree and the stake.

3.06 Pruning

A. Where determined by ENGINEER, pruning will be required.

B. Pruning of the new plants shall be done by workmen experienced in this type of Work. Pruning shall be completed prior to planting. Hedge shears shall not be permitted for pruning.

C. Pruning shall be done in accordance with the best standard practices.

D. Deciduous trees shall have branches pruned to balance the loss of roots in such a manner as to retain the natural form of the tree type. Evergreen trees shall be pruned only to the extent of removing broken or damaged branches. Cuts shall be made flush, leaving no stubs. Paint cuts over ¾" (20 mm) in diameter with tree paint.

E. Notify ENGINEER at least one (1) week prior to pruning operations.

3.07 Watering, Fertilizing and Cultivating

A. Plants shall be thoroughly soaked after planting. After watering, beds shall be raked and left in a complete and finished manner.

B. Watering, Fertilizing and Cultivating is required during the Establishment Period. Watering, Fertilizing and Cultivating shall include measures necessary to establish and maintain plants in a vigorous and healthy growing condition for the entire Establishment Period.

C. CONTRACTOR shall manually water the plants a minimum of once a week or as necessary to keep the plant in a thriving condition from May 15 until October 15 or for the duration of the Establishment Period.

D. If the planted areas have an automatic irrigation system that CONTRACTOR is relying upon, it is the responsibility of CONTRACTOR to ensure that the irrigation system is running properly. If CONTRACTOR concludes that at any time the irrigation system is not working properly, then they shall notify ENGINEER or OWNER so that it may be fixed in a timely manner. However, CONTRACTOR will have to manually water the plants as necessary to keep them in a thriving condition at all times that the irrigation system is not working properly.

E. Keep planting beds and tree saucers free from weeds to the satisfaction of OWNER. Treat mulch with pre-emergent weed killer.

F. Keep trees erect. Raise trees that settle below grade to the established elevation. Keep tree wrap and wire in neat condition. Prune dead or broken branches from all trees and shrubs. Fill to the original grade level areas that have settled around trees and shrubs.

G. Winter protection shall include late fall spraying of evergreen trees and evergreen shrubs with anti-desiccant, emulsion type agent, at the manufacturer's recommended rate to prevent winter desiccation and late fall watering if required by a dry season.

H. At the seasons first watering, an ENGINEER-approved organic timed release, balanced fertilizer shall be applied to the ground around the tree at the rate instructed by the manufacturer. In lieu of organic fertilizer, pre-packaged, controlled release fertilizer packets may be used. Use one (1) 2-ounce packet of fertilizer per every inch (25 mm) caliper of tree, or one (1) 2-ounce packet for every shrub.

I. During the first and second watering of the growing seasons, the water used for each plant shall be a nitrogen-enriched solution containing available nitrogen at the rate of 8.3 pounds per 1,000 gallons (1 kg/kl) of water (42 pounds of 20-0-0, or 18 pounds of 45-0-0, fertilizer per 1,000 gallons of water). No fertilizer shall be applied after July 7.

J. During the establishment period(s) as called for in the Contract Documents, CONTRACTOR shall do all required watering, cultivating, pruning, fertilizing, weeding, and all other work necessary to keep the planted material vigorously growing sound and healthy. CONTRACTOR shall repair or replace any guying or bracing which is damaged, destroyed, or broken. CONTRACTOR shall spray any plant material which becomes diseased or infested with insects.

K. CONTRACTOR shall repair or replace any trees which are blown over, knocked down, uprooted or otherwise become impaired or defective. CONTRACTOR shall replace any plant material which is not in good physical condition, has more than 20% die back, shows defective growth, disease, signs of insect infestation, or any other signs of impairing defects during the Establishment Periods.

L. CONTRACTOR shall repair or replace any plant material damaged or impaired by wind, rain, snow, ice, sleet, sun, heat, drought, or any other weather related occurrences. Costs for all labor, material, and equipment necessary to carry out the provisions of this Article shall be included in CONTRACTOR's bid price for the planting of trees unless otherwise indicated in the Proposal. CONTRACTOR shall notify ENGINEER prior to beginning any work called for under this Article.

M. At the end of the Establishment Period, unless otherwise determined by ENGINEER, the guying material, wrapping material, identification tags, and inspection tags shall be removed and disposed of off the project and the mulch around all the plants shall be replenished to the required depth of five to six inches (125 - 150 mm).

3.08 Establishment Period

A. The Establishment Period shall begin on the day of written acceptance of the installation of the trees, shrubs, bulbs, ground cover or other plant material. Each subsequent establishment period shall begin on the same day of the succeeding year(s). The Establishment Period shall be a minimum of one year unless otherwise indicated in the Contract Documents.

3.09 Schedules

A. General planting location, type and size of tree or shrub shall be as indicated on the Plans. Substitutions of plant material or alteration in plant sizes or specifications shall be approved by ENGINEER prior to ordering.

3.10 Steel Landscape Edging

A. Install steel landscape edging where indicated on Drawings, according to manufacturer's recommendations. Anchor with steel stakes spaced approximately 30 inches on-center, driven below top elevation of edging, or at every stake pocket location in landscape edging sections designed and manufactured to receive stakes. Stakes shall be located in solid undisturbed soil, or in soil compacted to 85% of its maximum density.

B. Install straight sections true to the alignments as indicated, free of waves or bends, using strings as guides. Install curved sections true to the alignments as indicated, free of waves or bends, following marked alignments approved in the field by ENGINEER. ENGINEER shall be given the opportunity to review the layouts. Set top of edging flush with finish grade. Set top of stake ½-inch below top of edging.

C. Replace edging sections damaged by construction operations.

End of Section

Section 32 9219
Seeding

Part 1 General

1.01 Scope of Work

A. This Section includes seeding complete with earth bed preparation, providing and placing topsoil, preparation and fertilizing topsoil, sowing of seed for lawns and other ground cover, protection of seeded areas, watering of seeded areas, mowing of seeded areas, protection and cleanup.

1.02 Related Work Specified Elsewhere

A. Section 31 2198: Site Construction Preparation Requirements
B. Section 31 2200: Grading
C. Section 32 9223: Sodding

1.03 Requirements of Regulatory Agencies

A. Comply with the applicable requirements of the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division, Michigan Seed Law, Act 329, PA of 1965, as amended.

B. Comply with the applicable requirements of the Proceedings of the Association of Official Seed Analysts, Rules for Testing Seeds.

C. Chemical fertilizer shall be supplied in suitable bags with the net weight of the contents and guaranteed analysis shown on the container. Bulk shipments shall be accompanied by an analysis and net weight certification of the shipment. Custom mixed fertilizers shall be accompanied by a certification of the weight of each commercial fertilizer used in the mixture and a guaranteed analysis of each shipment expressed in percentages of total Nitrogen (N), total available Phosphoric Acid (P_2O_5) and total available Potash (K_2O) included.

1.04 Source Quality Control

A. A seed mixture proposed for use in the Work shall have been tested for purity and germination by the Seed Producer within nine (9) months of sowing.

1.05 Reference Standards

A. ASTM - American Society for Testing and Materials

B. MDOT - Michigan Department of Transportation, Standard Specifications for Construction, 2003

1.06 Submittals

A. Submit Seed Producers Certification that seed meets the requirements of these Specifications and conform to the State of Michigan Seed Act referenced above under Article 1.03 of this Section.

B. Where required, submit test reports for all seed proposed for use in the Work to ENGINEER, showing results of purity and germination tests, compliance with regulatory agencies, dates and location of tests.

1.07 Product Delivery, Storage, and Handling

A. Material shall be delivered to the Project site in their original, unopened containers. Containers shall be clearly marked showing, name of manufacturer, brand name, trade name or generic name of material, warranty of analysis, net weight of contents and date of packaging, where applicable.

B. Seed shall be delivered to the site in durable bags, tagged or labeled to show date of tests, warranty of purity and germination analysis, name, lot number and net weight of contents.

C. Commercial fertilizers shall be delivered to the site of the Work in the original unopened bags. Bags shall not exceed 100 pounds (45 kg) net weight each and shall be clearly marked with guaranteed analysis in a conspicuous location on each bag.

D. Material shall be stored at the Project site, under shelter, off the ground and shall be protected from damage by moisture, temperature, exposure to elements, vandalism or other action which might otherwise impair their use.

E. Materials proposed for use in the Work shall be handled in a manner that will protect the material and the personnel involved in the Work. Handle seed in a manner which will protect the mixture from contamination or deterioration.

1.08 Environmental Requirements

A. Seeding is limited to the periods between April 20 and June 1, August 10 to October 1 and after November 20 for as long as weather permits preparation of the seed bed without irrigation and/or mulch. With the use of irrigation and/or mulch, seeding can be done from April 20 thru October 1 inclusively.

B. Comply with the limitations placed on the use of certain soil protection materials because of prevailing temperatures as described in this Section.

C. Comply with the limitation placed on seeding applications because of wind velocity as described-in this Section.

1.09 Protection

A. Provide suitably approved warning signs and barricades for protection of seeded areas from pedestrian or vehicular traffic. Protect all newly seeded areas during the progress of the Work and until completion of the turf establishment period.

B. Protect all adjacent construction from topsoil spills and perform such cleanup of affected surfaces before it becomes compacted by traffic.

1.10 Final Acceptance

A. CONTRACTOR shall establish a dense cover of seeded grass on disturbed areas.

B. These areas shall be maintained until final acceptance of the Work by ENGINEER.

C. ENGINEER will inspect the turf to insure that the grass seed is well established, weed free, in a growing and vigorous condition.

D. Areas that do not meet the approval of ENGINEER shall be re-seeded at CONTRACTOR's expense.

Part 2 Products

2.01 Seed

A. Seed and seeding mixtures shall be certified, mature, clean, dry, new crop seed products suitable for the specified applications and having the percentages of purity, germination and proportions, by weight, indicated in Table 1.

Table 1 - Seeding Mixtures

	Seeds		**Mixture Proportions (%)**			
Kind	Purity	Germination	TDS	TUF	TGM	THM
Kentucky Blue Grass	98%	80%	5	10	10	30
Perennial Rye Grass	96%	85%	25	20	20	20
Hard Fescue	97%	85%	25	20	30	
Creeping Red Fescue	97%	85%	45	40	40	50
Fults Salt Grass	98%	85%*		10		

Table 2 – Soil Types and Location of Seeding

Symbol for Turf Seed Mixture	**Soil Type**	**General Location**	**Rate of Seeding lbs/ac (kg/ha)**
TDS	Dry Sandy to Sand Loam	Rural or Urban	250 (280)
TUF	All Types	Urban Freeway, Blvds, City Streets	250 (280)
TGM	Medium to Heavy	All	250 (280)
THM	Loamy to Heavy	Home and Business Turf	250 (280)

B. The specific mixture to be used shall be for the type of soil on the Project and the location of the seeding unless otherwise indicated on the Plans or as designated by ENGINEER.

C. Hydroseeding shall consist of a blend of seed, fertilizer and hydromulch.

2.02 Mulching Material

A. Straw:

1. Small grain straw or grass or marsh hay acceptable to ENGINEER.

B. Wood Excelsior:

1. Green wood fibers, baled or blanket of type and manufacture acceptable to ENGINEER.

2. Wood excelsior shall be made of green timber fiber baled so that the bales weigh 80 to 90 pounds at the time of manufacture.

3. Wood excelsior blankets shall be made of a uniform web of interlocking fibers with a backing of fabric netting on one (1) side only. The fabric net shall have a mesh size not exceeding 1-1/2" x 3" (40 mm x 75 mm) and shall be a woven of either cotton cord, twisted paper cord or a synthetic, biodegradable fiber. Blankets shall be produced in the form of a tightly compressed roll 36 inches ± 1-inch (900m m ± 25 mm) wide and approximately 120 feet (36 m) long. Blanket shall have a fiber net on the outside of the fiber mat. Blanket roll weight, when manufactured, shall average 85 pounds (38 kg) ± 10%. Each roll shall have separator sheets of 40 pound Kraft paper placed at the beginning and at the end of each roll to facilitate unrolling and handling at the job site. The Kraft paper sheet at the end of each roll shall also form a wrapper for the roll.

C. Netting:

1. Twisted Kraft paper or synthetic fiber, biodegradable woven mesh net material suitable for the application and acceptable to ENGINEER.

2. The net shall consist of a biodegradable mesh with openings not to exceed 1-1/2" x 3" (40 x 75 mm)

3. The net shall be furnished in widths of not less than 35 inches (900 mm).

D. Proprietary Mulch Material:

1. Biodegradable natural and/or synthetic materials suitably fabricated and acceptable to ENGINEER.

2.03 Mulch Anchoring Material

A. Emulsified Asphalt:

1. ASTM D977, Rapid Setting (R.S. 1 or 2), Medium Setting (M.S. 2 or 2h) or Slow Setting (S.S. 1).

B. Mulch Anchoring Tool:

1. Suitable unit having a series of flat, notched discs for punching and anchoring mulch in soil, or a regular farm disc weighted and set nearly straight as a substitute.

C. Latex Base Adhesive:

1. Latex base adhesive mixed with water at a ratio of 25 gallon of water to 1 gallon adhesive with 25 pounds of recycled newsprint as a tracer (14 L of adhesive with 0.35 kL of water with 28 kg of newsprint).

D. Recycled Newsprint:

1. Mix 7 pounds of newsprint with 7 gallons of water (60 kg of newsprint with 1000 L of water).

E. Guar Gum:

1. Mix 1 pound of dry adhesive with 26.5 gallons of water with 5 pounds of recycled newsprint as a tracer (55 kg adhesive / 12 200 L water / 280 kg newsprint).

2.04 Fertilizer

A. Fertilizer shall be a standard commercial grade fertilizer, conforming to state regulations, of the type recommended for grasses. The fertilizer shall contain slow release nitrogen amounting to 75% of the nitrogen available. Fertilizer shall be uniform in composition, free flowing and suitable for application with method selected. Fertilizer for hydraulic seeding shall be soluble or ground to a fineness that will permit complete suspension of all insoluble particles in the slurry.

2.05 Agricultural Liming Materials

A. Burnt lime (quick lime), hydrated lime, limestone (calcite and dolomite), marble shells and by-products shall conform to the requirements of ASTM C602.

2.06 Water

A. Free of matter harmful to plant growth.

2.07 Staples

A. Wire staples for holding mulching materials in place shall be not less than six (6) inches (150 mm) long No. 11 (U.S. Steel Gage) steel wire or longer.

2.08 Topsoil

A. Topsoil shall be fertile, friable, sandy clay loam without admixture of subsoil. Topsoil is to be free of glass, stones greater than one (1) inch (25 mm) in any dimension, weeds, undesirable grasses and other extraneous materials. Topsoil shall have the following range of values:

1. Soil pH ..... 5.0 to 7.5
2. Soluble Salts ..... 500 ppm max
3. Organic Content ..... 5 to 30 %
4. Silt Content ..... 35% to 50%
5. Clay Content ..... 5% to 10%
6. Deleterious Material* ..... 5% max

*rock, gravel, stone, sticks, roots, sod, etc.

B. Compost may be mixed with topsoil to obtain the desired content. Topsoil is to be final screened thru a 5/8-inch (15 mm) maximum mesh screen prior to delivery to the Project site. ENGINEER shall review source and final screen results prior to release of topsoil. CONTRACTOR shall submit a certified analysis of the topsoil from each source to ENGINEER. Topsoil shall be placed in 3-inch (75 mm) minimum thickness throughout, or as specified in the plans or Specifications.

C. CONTRACTOR shall obtain his own topsoil borrow pit source and shall obtain all necessary permits and agreements for the use of such borrow pits at his own expense.

2.09 Improved Topsoil

A. Improved topsoil shall consist of a mixture of 2/3 topsoil and 1/3 compost. Compost shall be mature/stabilized, humus-like material derived from the aerobic decomposition of yard waste (i.e., grass clippings and leaves) or other materials as designated compostable as defined in P.A. 641 as amended and shall be in compliance with all federal and state laws. The improved topsoil mixture shall have a dark brown or black color, be capable of supporting plant growth without ongoing addition of fertilizers or other soil amendments and shall not have objectionable odor. The mixture shall be free of glass, plastic, metal, and other contaminants, as well as viable weed seeds and other plant parts capable of reproducing. The mixture shall be such that no visible water or dust is produced when handling it.

B. The manufacturer of the compost shall maintain annually on file with the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division, test data and a statement to show that the following criteria are being met by the compost provided for the project.

C. The composition of the compost shall be within the following range of values:

	Quality Parameter	Range of Value
1.	Soil pH	6 to 7.5
2.	Soluble Salts	2 to 5 mmho/cm
3.	Carbon/Nitrogen Ratio	13 to 20 parts C to 1 part N
4.	Inerts	< 1%
5.	Organic Matter	35 to 55 %
6.	Nitrogen	1 to 2 %
7.	Phosphorus	0.2 to 0.8 %
8.	Potassium	0.5 to 1.5 %
9.	Unit Weight	535 to 775 Kg/m3
10.	Moisture Content	40 to 50 %
11.	Particle Size	< 20 mm maximum
12.	Water Holding Capacity	> 100%
13.	Heavy Metals	None

D. Maturity/Stabilization: An acceptable test that can demonstrate Maturity/Stability.

E. Temperature: The compost material must have undergone the procedure to significantly reduce the pathogen level as referenced in EPA 40 CFR, Part 257 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations. The temperature must be maintained at 40° C for 5 days with a temperature exceeding 55° C for at least 4 hours.

F. Pathogens and Trace Elements: Shall meet the requirements of EPA 40 CFR; Part 503 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations.

G. To comply with the annual filing requirements with the Michigan Department of Agriculture, Pesticide and Plant Management Division, the supplier of the compost shall certify that the compost meets Michigan P.A. 641 as amended and EPA 40 CFR, Part 257 and 503 Regulations, Federal Register Vol. 58, No. 32; dated 2/19/93; Rules and Regulations.

H. A data sheet shall accompany the certification.

I. The data sheet shall show the following:

1. Standard compost total nutrient test results, including N, P, K, Ca, Mg, Mn, Cu, Fe total carbon, pH, as provided by an acceptable testing laboratory
2. Organic content

3. Inert contamination

4. Soluble salts

5. Carbon/Nitrogen ratio

6. Proof of maturity/stability acceptable to the Michigan Department of Agriculture

J. The certification and data sheets shall be mailed annually to the Michigan Department of Agriculture, Agriculture Environment Coordinator. The date shall be included on which the compost test results were mailed to the Michigan Department of Agriculture.

Part 3 Execution

3.01 Preparation of Subgrade

A. Complete all fine grading within the areas to be covered with topsoil necessary to bring the surface of the proposed subgrade to the elevations indicated on the Plans and parallel to the proposed finished grade. The surface of the subgrade immediately prior to being covered with topsoil shall be raked or otherwise loosened to a minimum depth of two (2) inches (50 mm) to facilitate making a bond between the subsoil and the topsoil.

3.02 Preparation of Soil

A. After the areas to be seeded have been brought to the required grade and properly trimmed and cleaned up, the existing soil shall be brought to a friable condition by harrowing or otherwise loosening and mixing to a depth of at least four (4) inches (100 mm). Lumps and clods shall be thoroughly broken. When the area to be seeded has been prepared and covered with a layer of topsoil as specified under Article 3.01 of this section, this operation will not be required.

3.03 Preparation of Mulch Material

A. When seed is to be sown through mulch which has been in place for a period of more than two (2) weeks or which is being held in place by a surface-applied coating of asphalt emulsion or other adhesive, the mulched area shall be prepared for seeding by discing, a spike-toothed harrow, or by other means acceptable to ENGINEER.

3.04 Placing and Spreading Topsoil

A. Topsoil shall be placed and spread over the area designated on the Plans, or as determined by ENGINEER, to a depth of four (4) inches, ± 1-inch (100 mm ± 25 mm) or to such depth as specified on the plans.

B. In all cases, topsoil shall be placed to a depth sufficiently greater than that shown on the Plans or specified so that, after natural settlement or rolling, the completed Work will conform to the lines, grades and elevations shown on the Plans.

C. Spreading of topsoil shall be completed in such a manner that seeding as specified can proceed without additional moving of topsoil. Topsoil furnished and placed shall be considered incidental to seeding unless otherwise specified in the Proposal.

D. After topsoil is spread, all large earth lumps, rocks, roots, debris, or other foreign matter shall be raked and removed from the topsoiled area and legally disposed of by CONTRACTOR.

3.05 Fertilizing

A. Chemical fertilizer shall be applied on the prepared soil surfaces at a minimum rate of 1/3 ton per acre (666 lbs/ac.) (750 kg/ha) of 12-12-12 fertilizer, or such other rate of another fertilizer mixture that yield 240 lbs/acre (270 kg/ha) of nutrient. Dry fertilizers shall be thoroughly disced, harrowed or raked into the soil to a minimum depth of not less than 1-inch (25 mm). Where hydraulic seeders are used for sowing seed, one half the recommended rate of fertilizer may be spread in combination with such sowing with the balance incorporated into the soil prior to seeding. In all other cases, fertilizer shall be incorporated into the soil before any seeding is started.

3.06 Seeding

A. Seed of the kind required shall be sown at the rate as specified in Table 2. Seed shall be sown in the presence of an inspector by mechanical spreader, hydraulic seeder or broadcasting. The broadcasting method shall be used for sowing seed only in areas inaccessible to mechanical spreading equipment. Seeding during winds above 15 miles per hour (25 km/hr) shall not be permitted.

B. Prior to placing seed materials, water topsoil to a depth of four (4) inches (100 mm) at least 48 hours prior to seeding operations to obtain a loose friable seed bed. Time and depth of watering operations shall be varied at the direction of ENGINEER for varying conditions at the site of the Work.

C. Broadcasting methods for sowing seed materials shall be accomplished by spreading one-half of the specified amount of seed in one direction and then broadcasting the remaining one-half of the seed at right angles to the first seeding pattern using the same broadcast method. Rate of broadcast shall be as specified herein or per the written recommendations of the Producer of the seed material used. Roll seeded area with roller weighing a maximum of 150 pounds/foot (225 kg/m) of width.

D. Hydroseeding shall be performed using suitably acceptable hydraulic seeding equipment and a homogeneous slurry solution of water, seed, fertilizer and suitable mulch material as approved by ENGINEER. Seed slurry mixture shall be distributed uniformly at a rate approved by ENGINEER for the seed materials, fertilizer and/or mulch materials used to suit the seed application rate. Seed application rate shall be 300 lbs/acre (340 kg/ha).

3.07 Mulching

A. Mulching shall consist of placing a mulch material on areas that have been or are to be seeded. Mulch shall be placed in a loose enough condition so as to allow penetration of sunlight and circulation of air, but thick enough to shade the ground, reduce rate of water evaporation and prevent or reduce erosion by wind or water. Mulch shall be secured with suitably acceptable anchoring material.

B. For surfaces and slopes on which power equipment can be operated, satisfactory mulching materials include the following:

C. Small grain wheat straw or grass hay applied at 1-1/2 to two (2) tons per acre (3.5 to 4.5 metric ton/ha) with disc packer, asphalt or netting tie-down.

D. Wood chips applied at six (6) to nine (9) tons per acre (13.5 to 20.0 metric tons/ha).

E. Asphalt emulsion alone at 600 to 1,200 gallons per acre (5.5 to 11. kl/ha). (This application is suitable for limited periods of time and where trampling by either people or animals will not occur.)

F. For surfaces and slopes where power equipment cannot be operated, satisfactory mulching materials include the following:

G. Straw or grass hay applied at 1-1/2 to two (2) tons per acre (3.5 to 4.5 metric tons/ha), anchored with asphalt or netting tie-down.

H. Asphalt emulsion alone at 600 to 1,200 gallons per acre (5.5 to 11.0 kl/ha). (Limited to areas where tracking is not a problem.)

I. Commercially available erosion control netting of jute, paper or biodegradable synthetics.

J. Continuous filament fiberglass at 1,000 pounds per acre (1100 kg/ha) anchored with 150 gallons (1400 l/ha) of asphalt emulsion.

K. Anchor straw or hay mulch by the methods as specified herein.

L. Wood chips will not need anchoring when used on workable slopes.

M. Commercially manufactured netting and/or fiberglass materials shall be anchored in accordance with the manufacturer's printed instructions for the material used.

N. Punch and anchor mulch material into soil using mulch anchoring tool. Soil must be moist, free of stones and loose enough to permit disc penetration to a depth of three (3) inches (75 mm).

O. Blow on liquid or emulsified asphalt materials with the straw or hay mulch or spray or sprinkle asphalt tie-down materials immediately after mulch is spread.

P. Apply emulsified asphalt at 0.04 gallons per square yard 0.2 l/m^2). Do not apply emulsified asphalt during freezing weather since it contains approximately 50% water. Apply liquid (cut back) asphalt at approximately 0.10 gallons per square yard (0.45 l/m^2). Liquid asphalt may be applied during freezing weather since it is cut back with kerosene.

3.08 Conversion from Soil Protection to Permanent Vegetation

A. Following straw or hay mulching, grass seeding can be made in early spring by broadcasting seed directly into the mulch. Fertilizer or lime, where needed, should be incorporated into the soil before mulching.

B. Asphalt emulsion alone can be readily incorporated into the soil by ordinary tillage before seeding.

C. Wood chip mulch may be removed before seeding or incorporated deeply into the soil. If wood chips are incorporated into the soil, the addition of extra nitrogen fertilizer to the soil will be required to provide nitrogen in the new seeding.

D. Fiberglass mulch shall be removed before seeding because of its permanence. Care shall be taken to prevent fiberglass filaments left in place from becoming entwined or wound around shafts of power mowers or other power equipment.

E. Acceptable proprietary netting and erosion control materials shall be disposed of in accordance with the manufacturer's printed instructions for the material used prior to any seeding operations.

3.09 Turf Establishment

A. Seeded areas shall be watered whenever excessive drying is evident during the period set for establishment. Watering shall be done in a manner that will prevent erosion due to the application of excessive quantities and the watering equipment shall be of a type that will prevent damage to the cultivated surfaces. CONTRACTOR shall be responsible for the proper care of the seeded areas until final acceptance of the entire Work covered by the Contract.

B. The seeded areas shall be mowed with mowing equipment acceptable to ENGINEER to a height of two (2) inches (50 mm) whenever the average height of grass establishment reaches four (4) inches (100 mm). When the amount of cut grass is heavy, cut grass shall be removed to prevent destruction of the underlying grass. If weeds or other undesirable vegetation threaten to smother the planted species, such vegetation shall be mowed, or in the case of rank growths, shall be uprooted, raked and legally disposed of from the area.

C. Reseed and mulch areas larger than four (4) square inches (25 cm^2) not having a dense, uniform, vigorous stand of grass acceptable to ENGINEER.

D. The establishment period shall extend for a period from the time of seeding until the seeded area has a uniform stand of grass acceptable to ENGINEER. The minimum period shall be 30 days.

E. If after 60 days from the initial seeding a dense, uniform, vigorous stand of grass has not been established by CONTRACTOR, OWNER may reseed the defective areas and all costs will be deducted from CONTRACTOR's payments.

End of Section

Section 32 9223
Sodding

Part 1 General

1.01 Scope of Work

A. This Section includes sodding complete with earth bed preparation, providing and placing topsoil, compacting and finishing topsoil, furnishing and placing sod, furnishing and placing stakes, watering sod, rolling and tamping sod, mowing sod, replacing defective or deteriorated sod and maintenance and care of sod in place.

1.02 Related Work Specified Elsewhere

A. Section 31 2198: Site Construction Performance Requirements
B. Section 31 2200: Grading

1.03 Requirements of Regulatory Agencies

A. Comply with the applicable requirements of the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division, Act 189, Insect Pests and Plant Diseases, PA 1931, as amended for all nursery grown sod.

1.04 Submittals

A. CONTRACTOR shall submit copies of Sod Growers Certificate to ENGINEER indicating nursery from which sod was taken, grass species and percentage in accordance with the Michigan State Department of Agriculture Regulations referenced above.

B. When requested by ENGINEER, submit evidence of topsoil borrow pit agreement for pits used by CONTRACTOR.

C. Submit test results for imported topsoil.

1.05 Product Delivery, Storage, and Handling

A. Sod shall be delivered to the project site on suitable wooden pallets. Sod shall be delivered in manageable rolls and the amount of sod delivered shall not exceed that which can be installed in one 24-hour period. Sod that has been damaged during delivery will be rejected.

B. Store sod in such a manner as to protect roots and grass material from exposure to wind and sunlight, freezing or other injury. When stacked, sod shall be placed roots-to-roots or grass-to-grass in rolls. Sod shall be kept moist during storage, under shade or covered with moistened burlap. Sod that has been damaged or has deteriorated because of storage will be rejected.

C. Sod shall be handled in a manner to prevent breaking or other damage. Sod shall not be handled by pitch forks or by dumping from trucks or other vehicles. Care shall be taken at all times to retain the native soil on the roots of each sod roll during stripping and handling. Sod that has been damaged by handling will be rejected.

1.06 Environmental Requirements

A. Perform sod cutting and removal during soil moisture conditions as specified under Article 3.03 of this Section.

B. Sod shall not be placed during drought nor between the dates of June 1 and August 15, inclusive, unless approved by ENGINEER.

C. Sod shall not be placed when the ambient air temperature is below 32 degrees F (0° C).

1.07 Protection of Work

A. Provide suitably approved warning signs and barricades for protection of new sodding from pedestrian or vehicular traffic. Protect all newly sodded areas during the progress of the Work and until the completion of the turf establishment period.

B. Protect all adjacent construction from topsoil spills and perform such cleanup of affected surfaces before it becomes compacted by traffic.

1.08 Planting Schedule

A. CONTRACTOR will be required to have a minimum of 90% of the sod placed at least one (1) month prior to final acceptance of the complete Project to insure adequate rooting of the sod.

1.09 Final Acceptance

A. CONTRACTOR shall establish a dense cover of sod grass on all disturbed areas. These areas shall be maintained until final acceptance of the Work by ENGINEER. ENGINEER will inspect the sodded turf to insure that the sod is well established, weed free, in a growing and vigorous condition. Areas that do not meet the approval of ENGINEER shall be re-sodded at CONTRACTOR's expense.

Part 2 Products

2.01 Sod - General

A. Dense, well-rooted growths of perennial and desirable grasses other than Merion Blue Grass, indigenous to the general locality where it is proposed for use, free of noxious weed, relatively free of weeds and undesirable plants, in general, large stones, roots and other material which might be detrimental to the growth, development or future maintenance of the sod.

B. Sod shall be in strips of uniform width, not less than 10-inches (250 mm) wide, with lengths of not less than 18-inches (450 mm) and an area of not less than 4.5 square feet (0.4 square meters). Sod grown on peat will not be accepted.

C. Sod shall be of uniform height when harvested. Vegetation more than four (4) inches (100 mm) in height shall be mowed to a height of three (3) inches (75 mm).

D. Sod when harvested shall have the following average thickness:

1. Field Grown Sod - 2 inches (50 mm)
2. Nursery Grown Sod - 1 inch (25 mm)

2.02 Nursery Sod

A. Nursery sod, shall be per MDOT section 917, grown on mineral soil with a strong, fibrous root system, and regularly fertilized and maintained according to established practices for at least two (2) years before cutting.

2.03 Field or Salvage Sod

A. Salvage sod existing on areas to be disturbed in construction or field grown sod meeting the requirements of Article 2.01 of this Section shall be used as indicated on the Plans or as directed by ENGINEER.

2.04 Topsoil

A. Topsoil shall be fertile, friable, sandy clay loam without admixture of subsoil. Topsoil is to be free of glass, stones greater than one (1) inch (25 mm) in any dimension, weeds, undesirable grasses and other extraneous materials. Topsoil shall have the following range of values:

1. Soil pH ..... 5.0 To 7.5
2. Soluble Salts ..... 500 ppm max
3. Organic Content ..... 5 to 30 %
4. Silt Content ..... 35% to 50%
5. Clay Content ..... 5% to 10%
6. Deleterious Material* ..... 5% max

*rock, gravel, stone, sticks, roots, sod, etc.

B. Compost may be mixed with topsoil to obtain the desired content. Topsoil is to be final screened thru a 5/8-inch (15 mm) maximum mesh screen prior to delivery to the Project site. ENGINEER shall review source and final screen results prior to release of topsoil. CONTRACTOR shall submit a certified analysis of the topsoil from each source to ENGINEER. Topsoil shall be placed in 4-inch (100 mm) minimum thickness throughout, or as specified in the plans or Specifications.

C. CONTRACTOR shall obtain his own topsoil borrow pit source and shall obtain all necessary permits and agreements for the use of such borrow pits at his own expense.

2.05 Improved Topsoil

A. Improved topsoil shall consist of a mixture of 2/3 topsoil and 1/3 compost. Compost shall be mature/stabilized, humus-like material derived from the aerobic decomposition of yard waste (i.e., grass clippings and leaves) or other materials as designated compostable as defined in P.A. 641 as amended and shall be in compliance with all federal and state laws. The improved topsoil mixture shall have a dark brown or black color, be capable of supporting plant growth without ongoing addition of fertilizers or other soil amendments and shall not have objectionable odor. The mixture shall be free of glass, plastic, metal, and other contaminants, as well as viable weed seeds and other plant parts capable of reproducing. The mixture shall be such that no visible water or dust is produced when handling it.

B. The manufacturer of the compost shall maintain annually on file with the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division, test data and a statement to show that the following criteria are being met by the compost provided for the project.

C. The composition of the compost shall be within the following range of values:

1.	Quality Parameter	Range of Value
2.	Soil pH	6 to 7.5
3.	Soluble Salts	2 to 5 mmho/cm
4.	Carbon/Nitrogen Ratio	13 to 20 parts C to 1 part N
5.	Inerts	< 1%
6.	Organic Matter	35 to 55 %
7.	Nitrogen	1 to 2 %
8.	Phosphorus	0.2 to 0.8 %
9.	Potassium	0.5 to 1.5 %
10.	Unit Weight	535 to 775 Kg/m3
11.	Moisture Content	40 to 50 %
12.	Particle Size	< 20 mm maximum
13.	Water Holding Capacity	> 100%
14.	Heavy Metals	None

D. Maturity/Stabilization: An acceptable test that can demonstrate Maturity/Stability.

E. Temperature: The compost material must have undergone the procedure to significantly reduce the pathogen level as referenced in EPA 40 CFR, Part 257 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations. The temperature must be maintained at 40° C for 5 days with a temperature exceeding 55° C for at least 4 hours.

F. Pathogens and Trace Elements: Shall meet the requirements of EPA 40 CFR; Part 503 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations.

G. To comply with the annual filing requirements with the Michigan Department of Agriculture, Pesticide and Plant Management Division, the supplier of the compost shall certify that the compost meets Michigan P.A. 641 as amended and EPA 40 CFR, Part 257 and 503 Regulations, Federal Register Vol. 58, No. 32; dated 2/19/93; Rules and Regulations.

H. A data sheet shall accompany the certification. The data sheet shall show the following:

1. Standard compost total nutrient test results, including N, P, K, Ca, Mg, Mn, Cu, Fe total carbon, pH, as provided by an acceptable testing laboratory

2. Organic content

3. Inert contamination

4. Soluble salts

5. Carbon/Nitrogen ratio

6. Proof of maturity/stability acceptable to the Michigan Department of Agriculture

I. The certification and data sheets shall be mailed annually to the Michigan Department of Agriculture, Agriculture Environment Coordinator. The date shall be included on which the compost test results were mailed to the Michigan Department of Agriculture.

2.06 Fertilizer

A. Fertilizer shall be a standard commercial grade fertilizer, conforming to state regulations, of the type recommended for grasses. The fertilizer shall contain slow release nitrogen amounting to 75% of the nitrogen available. Fertilizer shall be uniform in composition, free flowing and suitable for application with method selected.

2.07 Herbicides

A. Pre-emergent weed killer, Banlon, or ENGINEER approved equal.

2.08 Pegs

A. Pegs for sodding shall be sound wood, at least eight (8) inches (200 mm) long and have a cross sectional area of approximately 0.75 square inches (480 mm^2).

Part 3 Execution

3.01 CONTRACTOR's Verification

A. Prior to placing any topsoil, verify that earth bed in areas to receive sod have been completely stabilized to prevent settling and that grades have been made smooth, uniform and parallel to the finished grades and cross sections shown on the Plans. Ascertain that the tops and bottoms of all slopes are rounded off to form vertical curves and have been found acceptable to ENGINEER. Do no placing of topsoil until all earth bed conditions are accepted.

B. Prior to placing sod, verify that topsoil has been placed on the prepared earth bed to the proper depths shown on the Plans and as specified herein. Do not place any sod until topsoil conditions are satisfactory.

3.02 Offsite Source Inspection

A. Prior to commencement of sodding operations, notify ENGINEER of the off-site sources from which sod is to be furnished. ENGINEER, at his discretion, will inspect the sod at the offsite source.

3.03 Sod Harvesting

A. Sod shall be harvested by cutting into squares or into rectangular sections. The rectangular sections may vary in length, but shall be of equal width and of a size that will permit them to be lifted and rolled without breaking.

B. During the stripping process and all other handling of the sod, care shall be taken to retain the native soil on the roots.

C. Where off-site source inspection of sod is required by ENGINEER, no sod shall be harvested until such inspection is complete and sod is accepted.

D. Sod shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected.

E. When the soil is too dry, permission to cut sod may be granted by ENGINEER only after it has been sufficiently watered to moisten the soil to the depth at which the sod is to be cut.

3.04 Preparation of Subgrade

A. Complete all fine grading within the areas to be covered with topsoil as necessary to bring the surface of the proposed subgrade to the elevations indicated on the Plans and parallel to the proposed finished grade. The surface of the subgrade, immediately prior to being covered with topsoil, shall be raked or otherwise loosened to a minimum depth of two (2) inches (50 mm) to facilitate making a bond between the subsoil and the topsoil.

3.05 Placing and Spreading Topsoil

A. Topsoil shall be placed and spread over the area indicated on the Plans or as directed by ENGINEER. Topsoil shall be placed to a depth of four (4) inches (100 mm), unless otherwise indicated in the Contract Documents. At a minimum, topsoil placed shall be sufficiently greater than that shown on the Plans so that, after natural settlement or rolling, the completed Work will conform to the lines, grades and elevations indicated on the Plans.

B. After spreading topsoil, all large lumps, rocks, roots, debris or other foreign matter shall be removed from the topsoil by raking and disposed of off the site of the Work. Spreading shall be completed in such a manner that sodding operations can proceed without additional moving of topsoil. Topsoil furnished and placed shall be incidental to the sodding operations.

3.06 Sodding

A. Sod shall be laid within 24 hours after cutting and shall be properly protected during handling and placing. Sod shall be lifted from trucks or storage piles and placed on a moist earth bed by hand, making close joints without overlapping. All gaps between sections of sod and openings at angles shall be plugged with sod.

B. When placing sod on slopes, the Work shall begin at the base of the slope and progress upward by carefully placing the sod on the smooth slope, in rows, with the lengths running at right angles to the slope.

C. The transverse joints of sod strips shall be staggered and the sod carefully laid to produce tight joints. When the top of slopes are reached, the sod shall be carried back at least two (2) feet (600 mm) over the crest and trimmed to a line which is parallel to the top of the bank.

D. The areas back of the crest shall have been previously graded and the surface of the sod, when placed, shall be two (2) inches (50 mm) below the level of this area and covered with a layer of topsoil at least two (2) inches (50 mm) in depth and thoroughly compacted in a manner that will conduct the surface water from runoff over the edge of the sod.

E. No frozen sod shall be laid nor shall sod be laid on frozen soil.

F. On slopes steeper than one (1) vertical to three (3) horizontal, unless otherwise specified, the sod shall be staked with wooden pegs. There shall be at least one (1) peg in each piece of sod with a maximum between pegs of two (2) feet (600 mm). Pegs shall be driven flush with the surface of the sod. Laying and staking of the sod shall be done simultaneously. Where sod may be displaced during sodding operations, workmen shall work from ladders or treaded planks.

G. Rolling of the sod shall be done after initial watering and after the water has sufficiently soaked into the ground so that distortion of the sod surface and excessive compaction of the sod and the soil will not occur. The roller used shall be a water filled type at least three (3) feet (1 m) wide and 30 inches (750mm) in diameter and shall weigh approximately 300 pounds (135 kg). Roller shall be adequate to cause sod to make firm contact with the soil. A tamper, acceptable to ENGINEER, shall be used to press the sod firmly in place in areas not accessible to a roller. After tamping or rolling, the sod shall present a smooth, even surface, free from bumps or depressions.

H. Damaged, deteriorated or otherwise defective sod will be rejected by CONTRACTOR and except as otherwise provided herein, removed from the Project. Sod which has been permitted to dry out or become otherwise injured during transportation, handling, storage or placing shall be rejected. Where permitted by ENGINEER, rejected sod, if suitable, may be pulverized and used for filling, where necessary.

3.07 Turf Establishment

A. After laying, the sod shall be watered until saturated. Sod shall be watered whenever excessive drying is evident during the period set for establishment. Sufficient water shall be applied to wet the sod through completely and to wet at least two (2) inches (50 mm) of the sod bed each time watering is required. Watering shall be done in a manner that will prevent erosion due to the application quantities of water. The watering equipment shall be of a type that will prevent damage to the finished surfaces of topsoil and sod. The sod shall be watered as required until firmly knit in place and in a vigorous growing condition.

B. Two weeks after sodding, sod shall be fertilized at the rate of 900 lbs/ac. (1010 kg/Ha) of 5-20-20 (or equivalent nutrient) fertilizer.

C. The sodded areas shall be mowed a minimum of three (3) times with mowing equipment acceptable to ENGINEER. Sod shall be mowed to a height of three (3) inches (75 mm) whenever the average height of the grass becomes four (4) inches (100 mm). When the amount of cut grass is heavy, the cuttings shall be removed from the sodded areas to prevent destruction of the underlying turf. Where weeds or other undesirable vegetation threaten to smother the planted species, such vegetation shall be mowed or, in the case of rank growths, uprooted, raked and removed from the area. All mowed cuttings, uprooted or raked vegetation, shall be legally disposed of away from the Project Site.

D. The establishment period shall extend for a period from the time of sodding until the sodded area have received final acceptance of the entire Work covered by the Contract. The minimum period shall be 45 days.

End of Section

Section 33 2100
Water Supply Well

Part 1 General

1.01 Scope

The work to be done hereunder includes the furnishing of all labor, materials, transportation, tools, supplies, equipment, and appurtenances, unless hereinafter specifically excepted, necessary for the complete and satisfactory construction and development of one (1) Type III production well. The work also includes an 8-hour step drawdown test and water quality sampling.

The completed production well shall consist of the following principal items:

5" PVC Well Casing Pipe
4" Stainless Steel Well Screen

1.02 Requirements of Regulatory Agencies

The CONTRACTOR shall, at his own expense, procure all permits, certificates, and licenses required of him by law for the execution of work. The CONTRACTOR shall comply with all federal, state, or local laws, ordinances or rules, and regulations relating to the performance of the work.

1.03 Reference Standards

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM C150	Portland Cement
ASTM C494	Chemical Admixtures for Concrete
ASTM F480	Thermoplastic Well Casing Pipe and Couplings
AWWA A100	Water Wells
AWWA C651	Disinfecting Water Main
AWWA C654	Disinfection of Wells
Act 368, Part 127	Michigan Water Well Construction and Pump Installation Code
WD-03-003	Aquifer Test Requirements for Public Water Supply Wells (MDEQ)
DWRP-03-016	Grouting of Community Water Supplies
NSF/ANSI 61	Drinking Water System Components – Health Effects

1.04 Submittals

The CONTRACTOR shall submit four (4) copies of the following reports to the ENGINEER:

1. Step drawdown test report
2. Water quality results
3. Well log

1.05 Delivery, Storage, and Handling

Materials shall be delivered in an undamaged condition. Materials shall be stored off the ground to provide protection against oxidation caused by ground contact. Defective or damaged materials shall be replaced with new materials.

1.06 Quality Assurance

The CONTRACTOR shall be registered under Act 368, Part 127, P.A. of 1978, and Act 315 of the 1994 Regular Session of the Michigan Legislature, and shall employ only competent workmen for the execution of his work, and all such work shall be performed under the direct supervision of an experienced well driller satisfactory to the ENGINEER.

1.07 Services Provided by ENGINEER

The ENGINEER shall stake well locations. The ENGINEER shall determine top of casing elevation for well. The ENGINEER shall also provide a marked elevation on the side of the casing below the top of casing. The ENGINEER shall witness portions of the step test and water quality sampling.

1.08 Coordination

The CONTRACTOR shall be responsible for notifying the ENGINEER 48 hours before conducting the step/drawdown test and water quality sampling. The ENGINEER shall notify the CONTRACTOR when the well location has been staked.

Part 2 Products

2.01 Materials

Materials shall conform to the respective specifications and other requirements as specified herein.

A. Well Casing: 5” SDR-17 PVC

B. Well Screen

Type 304 or 316 stainless steel, size as indicated on the Plans. CONTRACTOR shall provide screen with adequate strength to resist external forces, both during and after installation. Length shall be per Plans or as determined necessary by formation sampling and as approved by the ENGINEER. Water velocity through openings shall not exceed 0.1 foot per second. The CONTRACTOR shall determine the well screen openings from an analysis of the sand in the water-bearing strata. Joints shall be the same material as the screen, with either threaded rings or butt-type welding rings. Screens shall be by Johnson Screens, or equal.

C. Gravel Pack

The CONTRACTOR shall provide clean, round, hard, water-worn quartz with less than 5 percent feldspar, no fossils, carbonate, or organics, and of proper size and gradation to allow free flow of water in the well and prevent the infiltration of sand. The CONTRACTOR shall select gravel size, based upon the analysis of the sand in the water-bearing strata; ratio of grain size of gravel-pack material to formation material shall range from 6:1 to 4:1. Gravel shall be chlorinated with granular chlorine installed with gravel pack.

D. Grout

The CONTRACTOR shall provide neat cement grout, Type I or II Portland cement conforming to ASTM C150, and water. The mixed grout shall contain no more than 6 gallons of water per bag of cement. Admixtures shall conform to ASTM C494, Michigan Water Well Construction Code and DEQ Type I policy.

E. Drilling Fluid

The CONTRACTOR shall provide a fluid composed of potable water and NSF-approved bentonite clay, readily thinned with commercial mud thinners. The specific gravity and the character of the mud-laden fluid shall be such that the production of the aquifers will not be impaired. Drilling fluid shall be prechlorinated with water at 10 ppm of chlorine. Drilling fluid shall meet the following properties during drilling: Weight – 70-85 lb/ft^3, Viscosity – 32-40 sec/qt, Filtration – 3/32 in. with maximum 20 cc water loss in 30 min, Sand Content – 2-4%, by volume.

F. Auxiliary Equipment

The CONTRACTOR shall provide discharge piping to dispose of pumped water during development and testing of the well. Discharge piping shall be located a sufficient distance, approximately 250 feet to the north, from the well to prevent flooding of the site and flow back into the aquifer; location to be approved by the ENGINEER.

Part 3 Execution

3.01 Well Construction

The depth of the well and screen provided shall be adequate to produce a guaranteed capacity of 25 gallons per minute (gpm) of clear, potable water.

A. Drilling

The CONTRACTOR shall drill a hole of sufficient diameter and depth as indicated on the Plans, and to additional depths as required to produce the flow capacity required. Methods of construction include using drilling mud for conventional fluid rotary drilling or reverse circulation drilling.

B. Casing Installation and Grouting

The casing shall be installed concentrically in the drilled hole and extended to a minimum depth as indicated on the Plans. Plumbness and alignment tolerances shall be in accordance with section 4.7.9 of AWWA A100. Installation of the casing shall not alter the shape, size, configuration or strength of the casing. Welded or threaded and coupled joints for steel pipe and deep socket bell ends or couplings for PVC pipe shall be provided in accordance with Michigan Water Well Construction Code. The void between the casing and the drilling hole shall be filled with neat cement grout to seal the casing to the wall of the drilled hole. Centralizers shall be provided at the bottom of the casing and at other critical grouting points such as zones of unsuitable water quality. The casing shall be grouted from the bottom upward to effectively seal the annular void. Grout shall be injected using a tremie pipe.

C. Well Screen Installation

Sufficient screen shall be provided at the water-bearing layer to be developed to secure available flow. Joints between screen sections and blank casing shall be welded or threaded and coupled. The screen

shall be sealed to the well casing per AWWA A100, section 4.5.9. The bottom of the screen shall be sealed with a threaded or welded plug, consisting of the same material and thickness as the screen body, or a welded plate, consisting of the same material and thickness as the screen body or casing.

D. Gravel Pack Installation

The CONTRACTOR shall disinfect and place the gravel with a tremie pipe. Speed of gravel placement shall be controlled to prevent bridging, voids or segregation and to allow for settlement of the gravel. Gravel placement equipment and gravel placement methods shall be approved by the ENGINEER prior to commencement of work. Drilling fluid shall meet the following properties during introduction of the gravel pack: Weight – max of 68 lb/ft^3, Viscosity – max of 30 sec/qt, Sand Content – max of 1%, by volume.

E. Well Development

The CONTRACTOR shall set the casing on the well and allow the neat cement grout to harden a minimum of 48 hours (24 hours with high-early cement) prior to well development. The CONTRACTOR shall furnish pumps, compressors, plungers, bailers, and other equipment required to fully develop the well for the maximum yield of water per foot of drawdown and to limit sand intrusion during the life of the well. The well shall be pumped free of sand, mud, drillings, and other foreign matter. Maximum sand concentration at the completion of well development shall be 5.0 ppm for a complete pumping cycle of 2-hr duration when pumping at the design-discharge capacity, as measured by using a Rossum Sand Tester.

F. Disinfection

The CONTRACTOR shall disinfect the well, equipment, and material in accordance with R325.1661 of Michigan Water Well Construction Code and AWWA C654. Piping shall be disinfected in accordance with AWWA C651. Two consecutive bacteriological samples, collected at least 24 hours apart, shall be analyzed for coliform bacteria and results returned non-detect. The CONTRACTOR shall notify the ENGINEER after the well has been disinfected and the ENGINEER shall witness collection of the water samples.

G. Sanitary Seal

The CONTRACTOR shall provide a sanitary seal for the well to prevent contamination until the pitless adapter is installed or the pump foundation and pump are installed on the well.

3.02 Waste Disposal

The CONTRACTOR shall excavate a mud pit on-site for disposal of waste materials and soil removed from the drilled hole. Location of the mud pit shall be outside of the 75-foot isolation radius for the well as indicated on the Plans. CONTRACTOR shall be responsible for informing the OWNER of the composition of the wastewater material and obtaining written permission from the OWNER to dispose of the wastewater on-site. If written permission cannot be obtained from the OWNER, the CONTRACTOR shall be responsible for removing the waste materials from the site and disposing of them elsewhere.

3.03 Field Sampling and Testing

A. Material Samples

During drilling of the well, the CONTRACTOR shall take samples of materials found in each soil stratum. Samples shall be preserved in approved containers furnished by the CONTRACTOR. In addition, samples shall be taken at five (5) foot intervals below the static water level within 5 feet either side of the proposed screen location to ensure that changes in sand size are noted. Samples shall be labeled to show depth below ground surface and thickness of the stratum from which the samples were obtained. The presence of clay shall be noted. The CONTRACTOR shall collect formation samples in white 5-gallon pails, allowing the fines to settle out.

B. Well Performance Testing

Upon completion of the well, the CONTRACTOR shall provide a temporary pump, orifice pipe or meter, and wetted or electric tape in the well for measuring the flow and drawdown. The CONTRACTOR shall furnish and install necessary pumping equipment capable of pumping to the required point of discharge a maximum of 40 gpm, with the pumping level estimated at approximately 100 feet below ground, but with satisfactory throttling devices, so that the discharge may be reduced to 10 gpm. The pumping unit shall be complete with prime mover of ample power, controls and appurtenances and shall be capable of being operated without interruption for a period of at least 24 hours. The CONTRACTOR shall notify the ENGINEER 48 hours before beginning the pumping test and shall make the necessary arrangements for conducting pumping tests.

The CONTRACTOR shall furnish all necessary discharge piping for the pumping unit, which shall be of sufficient size and length to conduct the water being pumped a distance of 100 feet from the well. The water shall be discharged with minimal soil erosion. The CONTRACTOR shall also furnish, install, and maintain equipment of approved size and type for measuring the flow of water. To measure the elevation of the water level in the well, a steel tape or electric measuring line shall be used.

Except as otherwise provided, the CONTRACTOR shall furnish all labor, motive power, lubricating oil and other necessary materials, equipment, labor, and supplies required, and shall operate the pumping units at such rates of discharge and for such periods of time as directed. If the test is disrupted, the CONTRACTOR shall allow the aquifer to recharge for a period of time as determined by the ENGINEER (1 week maximum) and then restart the test at no additional charge to the OWNER. Time stated for the duration of the final test is a minimum only, and the ENGINEER reserves the right to require the CONTRACTOR to extend such period of test, or to make additional tests.

A step drawdown test shall be performed to confirm full development of the well and aquifer characteristics, determine the specific capacity of the well, and determine well losses. The first step shall be 10 gpm; the second at 25 gpm; and the third step shall be at 40 gpm. The step drawdown test shall run for a minimum of 8 hours.

The CONTRACTOR shall make water level readings by wetted or electric tape method. Readings shall be as close as possible according to the following schedule:

1. Rest Period – no pumpage. The last reading should be just before starting the pump. Make readings:
    - every thirty (30) minutes for eight (8) hours

2. First Step – pumpage at 10 gpm until water level equalizes, but for a minimum of one (1) hour. Make readings:
    - every minute for first ten (10) minutes
    - every two (2) minutes for next ten (10) minutes
    - every five (5) minutes for next forty (40) minutes
    - every fifteen (15) minutes for the remainder of the step

3. Second Step – pumpage at 25 gpm rate until water level equalizes, but for a minimum of one (1) hour. Make Readings:
   - every minute for first ten (10) minutes
   - every two (2) minutes for next ten (10) minutes
   - every five (5) minutes for next forty (40) minutes
   - every fifteen (15) minutes for the remainder of the step

4. Third Step – pumpage at 40 gpm until water level equalizes, but for a minimum of one (1) hour. Make Readings:
   - every minute for first ten (10) minutes
   - every two (2) minutes for next ten (10) minutes
   - every five (5) minutes for next forty (40) minutes
   - every fifteen (15) minutes for the remainder of the step

5. Recovery Period – no pumpage. Make Readings:
   - every minute for first ten (10) minutes
   - every two (2) minutes for next ten (10) minutes
   - every five (5) minutes for next forty (40) minutes
   - every fifteen (15) minutes until the well has recovered

The CONTRACTOR shall furnish a complete written log of the pump test, showing static water level, pumping rate, and drawdown at the specified intervals. Excessive well losses indicated by the step test shall be corrected by the CONTRACTOR to the satisfaction of the ENGINEER by additional well development and testing. The efficiency target for the well shall be 75%.

C. Water Quality Determination

The CONTRACTOR shall be responsible for collecting, submitting and paying for the required water quality sampling. The CONTRACTOR shall collect sufficient water samples from the test/production well at the end of the step test for the following analyses to be performed by a laboratory certified for potable water sample analysis by the State of Michigan:

State Lab Code	Description
B	Water Coliforms (Bacteriology) – 2 samples 24 hrs apart
R	PartialChemistry (Nitrite,Nitrate,Hardness,Iron,Chloride,Sulfate,Fluoride,Sodium)
CAS	Arsenic
CPM1	Iron, Manganese, Copper, Zinc
CMIN	Complete Minerals
CCN	Cyanide
CMET2	Metals
CXVO	Organic Solvents by ITD
CXHB	Chlorinated Acid Herbicides
CXLP	Carbamates by HPLC/PCD
CXPT	Pesticides Screening by ECD and HPD

End of Section

Section 33 2105
Submersible Well Pump

Part 1 General

1.01 Description

A. Scope

This Section includes furnishing all labor, material, tools, equipment and accessories to provide submersible potable well pump (1-total) including pitless adapter, discharge pipe, submersible cable, pump controller and all testing, mechanical work and electrical work.

1.02 Quality Assurance

A. Reference Standards

Unless otherwise specified, the work for this section shall conform to the applicable portions of the following Standard Specifications:

AWWA - American Water Works Association Standard
AIEM - American Institute of Electrical Manufacturers

B. Installer Qualifications

The CONTRACTOR or subcontractor installing the work in this section shall be licensed by the State of Michigan to perform this type of work.

C. Requirements of Regulatory Agencies

All work shall be in accordance with the requirements of the State of Michigan Act 399, P.A. of 1976, Safe Drinking Water Act and the Administrative Rules published by the Michigan Department of Public Health.

D. Pump Design and Performance Criteria

Well Size: 5”
Discharge Connection: 1.25”
Drop Pipe: 125 ft
Power Requirements: 230V, 1-Ph, 3 hp
Design Flow: 25 gpm @ 266’ TDH
Manufacturer: Goulds, Grundfos, or equal.

1.03 Submittals

A. Manufacturer's Literature

Submit manufacturer's literature showing material types and sizes, fabrication methods, and other information as requested by the ENGINEER.

B. Shop Drawings & Product Data

Submit shop drawings and other product data for pump bowls, motors, discharge head, column assembly, suction pipe, suction strainer, and water level indicator sufficient to determine their compliance with the specifications.

C. Pump Curves

Submit pump performance curves demonstrating the pump's performance from zero capacity to maximum capacity based upon actual test data.

D. Operation & Maintenance Data

Operating instructions and maintenance data shall be provided in accordance with the requirements of Section 01300.

1.04 Guarantee

The CONTRACTOR shall guarantee satisfactory in-service operation of the mechanical and electrical equipment and related components for a period of one (1) year following acceptance, or as defined in the Proposal, at which time all unexpired manufacturer's equipment warranties shall be assigned to the OWNER.

Part 2 Products

2.01 Potable Well Pump

A. Pump shall be of stainless steel construction with impellers, diffusers, and bearing spiders constructed of non-toxic, corrosion resistant, glass filled engineered composite. Furnish pump with built-in poppet style check valve of stainless steel construction and FDA compliant BUNA rubber seal.

B. Motor shall be of stainless steel construction with hermetically sealed windings and replaceable motor lead assembly. Provide motors with built-in surge arrestor.

2.02 Accessories

A. Submersible Cable

The cable shall be comprised of three separate conductors or a single cable assembly with three conductors. Each conductor shall be insulated by synthetic rubber or plastic insulation suitable for continuous immersion in water. The cable shall be protected with a steel guard where it passes the bowl assembly to prevent damage from contact with the well casing. Stainless steel cable straps shall be provided to support the cable along the riser pipe at intervals of not more than 20 feet. Minimum size of cable shall be as stated in ASA specifications B58.1, Section B4.3.

B. Discharge Pipe

The discharge pipe may be furnished in random lengths connected by threaded sleeve couplings. The discharge pipe shall be galvanized steel and shall have ANSI standard tapered pipe threads. The pipe size shall be such that velocities are not less than 4-5 FPS, or more than 12 FPS.

C. Pitless Adapter

The pitless adapter shall be new, shop fabricated from the point of connection with the well casing to the unit cap or cover, constructed of materials and weight equivalent and compatible with the casing, be of watertight construction, frost proof, threaded or welded to the casing and utilize a contamination-proof entrance connection for electrical supply. For well casings up to and including 12-inches in diameter, the pitless adapter shall possess an inside diameter equal to the inside diameter of the well casing. The base shall also be provided with threaded openings for a well vent and a water level indicator. The pitless adapter shall be installed at a depth sufficient to provide a minimum of six feet of cover over top of the water main. The pitless adapter shall be as manufactured by Baker, or approved equal.

D. Pump Controls – Pump shall be controlled via a NEMA 3R magnetic contactor control box, high/low pressure switch and hydropneumatic tank. Refer to Plans for details.

Part 3 Execution

3.01 CONTRACTOR's Verification

A. Prior to installation of the pump assembly in the well casing, the CONTRACTOR shall verify that the casing is in proper condition to accept the pump and that the groundwater conditions are such that the proposed pump setting is proper to give the specified performance.

B. The pump bowls and impeller shafting shall be capable of permitting vertical position adjustment of the impellers to obtain the desired capacity.

3.02 Installation

A. Install pump and accessories in accordance with manufacturer's written instructions.

B. Each item of the pump assembly which comes into contact with the potable water supply system shall be thoroughly disinfected in accordance with AWWA Standard for Deep Wells, A100.

3.03 Field Quality Control

A. Field Performance Tests

Prior to acceptance, the CONTRACTOR shall check for motor overload by taking ampere readings and verify pump performance by measuring the flow and total dynamic head. Provide all calibrated and certified equipment, manpower, and any other materials/equipment necessary for a successful test. Correct all deficiencies to the satisfaction of the ENGINEER.

End of Section

Section 33 4100
Storm Utility Drainage Piping

Part 1 General

1.01 Scope of Work

A. This Section includes storm sewer Work indicated on the Plans complete with pipes, joints, structures, pipe bedding, final inspection and appurtenances.

1.02 Related Work Specified Elsewhere

A. Section 31 2319: Dewatering
B. Section 31 2316: Structural Excavation and Backfill
C. Section 31 2333: Trenching and Backfilling

1.03 Reference Standards

A. Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

1. ANSI - American National Standard Institute

2. ASTM - ASTM International

3. AASHTO - American Association of State Highway Transportation Officials

4. MDOT - Michigan Department of Transportation, 2003 Standard Specifications for Construction

5. NCPI - National Clay Pipe Institute

1.04 Source Quality Control

A. Laboratory test not less than one (1) percent, with a minimum of three (3) pieces each size, material and class of gravity pipe required in the Work.

1.05 Submittals

A. Submit a complete field report of the location of all wye openings and sump pump discharge leads to ENGINEER at the end of each sewer section of the Project or on the last day of each week, whichever occurs first.

B. Submit two (2) copies of the laboratory test reports required per Article 1.04 of this Section to ENGINEER.

C. Complete Shop Drawings for all manhole tees shall be submitted to ENGINEER.

D. Submit shop drawings and design information for all precast concrete box sections.

1.06 Storage of Materials

A. Piping material shall not be stacked higher than four (4) feet (1.2 m) or as recommended by the manufacturer, whichever is lowest. Suitable racks, chairs, and other supports shall be provided to protect preformed pipe mating surfaces from damage. Store bottom tiers off the ground, alternate tiers and chock tier ends.

B. Jointing and sealing materials used in the storm sewer system shall be protected from sunlight and stored in as cool and clean a place as practicable until ready for application.

1.07 Handling of Material

A. Load and unload materials using suitable approved equipment. Material shall not be dropped, bumped or allowed to impact against itself. Damaged material shall be rejected by ENGINEER.

B. Lifting devices shall be suited to the Work and shall protect surfaces from damage.

Part 2 Products

2.01 Materials

A. It is the intent of the Articles in Part 2 of this specification section is to specify in detail the various types of sewer pipe, joints, manholes, etc. which have been indicated throughout the Plans and Specifications. These Articles shall not be construed as allowing any alternate type of material to that which is indicated on the Plans or elsewhere in the Specifications.

2.02 Clay Pipe

A. Clay pipe shall conform to ASTM C700, extra strength vitrified clay pipe.

B. Premium joints shall be compression type joints conforming to ASTM C425.

C. When not specified, joints shall be made with cold applied pipe joint sealer. See Article 2.07 for requirements for cold applied pipe joint sealer.

2.03 Non-Reinforced Concrete Pipe Systems

A. Pipe shall conform to ASTM C14 Class III nonreinforced concrete sewer pipe.

B. When not specified, pipe joints shall be made with cold applied pipe joint sealer. See Article 2.07 for requirements for joints.

2.04 Reinforced Concrete Pipe

A. Reinforced concrete pipe shall conform to ASTM C76. Twelve (12) inch thru 30-inch (300 mm thru 750 mm) diameter pipe shall be Class II thru V, Wall B or Wall C, circular reinforced. Thirty-six (36) inch through 108-inch (900 mm thru 2700 mm) diameter pipe shall be Class I through V, Wall B or Wall C, circular reinforced or elliptical reinforced.

B. When elliptical reinforcement is used, the following method of indexing the steel and the pipe barrel shall be used.

C. A dummy lift pin form shall be set in the outer pipe wall form projecting into the pipe wall a minimum of 1-3/4 inches (45 mm) and a maximum of 2-1/4 inches (55 mm). An additional spacer chair shall be welded to the elliptical steel cage at the proper location so as to engage the dummy lift pin form during the pipe casting operation.

D. It is the intent of the spacer chair and dummy lift pin arrangement to provide a means of assuring the final position of the elliptical steel cage within the barrel of the pipe and, further, for providing a means of indexing the pipe in the field to assume proper placement of the pipe.

E. Prior to shipment of the elliptically reinforced pipe, they shall be striped along the inside top with a minimum 1-inch (25 mm) wide indelible marker so that final inspection of the pipe orientation can be made following completion of the installation.

F. For circular pipe 114 inches (2850 mm) or larger in diameter, the design information in accordance with Section 6 of ASTM C76, shall be submitted to ENGINEER for approval, prior to fabrication.

G. The design of all pipes shall meet the d-load requirements for the class of pipe indicated on the Plans.

H. When not specified, pipe joints shall be made with cold applied pipe joint sealer. See Article 2.07 for requirements for joints.

2.05 Reinforced Concrete Elliptical Pipe

A. Reinforced concrete elliptical pipe shall conform to ASTM C507.

B. When not specified, pipe joints shall be made with cold applied pipe joint sealer. See Article 2.07 for requirements for joints.

2.06 Precast Concrete Box Section

A. Precast concrete box sections shall meet the requirements of ASTM C1433. Unless specified otherwise, CONTRACTOR shall use the same design conditions as exist at the time of construction or as planned for future development.

2.07 Joints for Concrete or Clay Pipe

A. Sealed Joints:

1. When not specified, pipe joints shall be made with cold applied pipe joint sealer. Cold-applied pipe joint sealer shall conform to MDOT Section 909.09. The bituminous material shall be of such consistency that it may be spread on the joints with a trowel when the temperature of the air is between 20 degrees and 100 degrees Fahrenheit (-10 degrees and 40 degrees Celsius). Bituminous material shall adhere to the pipe so as to make a watertight seal and shall not flow, crack or become brittle when exposed to the atmosphere.

B. Premium Joints:

1. Premium joints for circular pipe shall conform to ASTM C443 limited as follows: Section 5.1 of C443, "Physical Requirements for Gaskets," shall be replaced with Section 6.9 of C361, "Rubber Gaskets." Also, Section 5 of C443 shall be limited to a modified grooved tongue to receive a rubber gasket.

2. Premium joints for elliptical pipe shall conform to ASTM C877, external sealing bands for non-circular concrete pipe. Width of the sealing bands shall be at least equal to twice the depth of the groove. For modified bell tongue and groove pipe, use the next larger gasket. Length of the sealing bands shall be equal to the outside circumference of the pipe at its largest diameter plus an amount equal to the width of the gasket to be used.

3. Only lubricant, as supplied by the pipe manufacturer, shall be used on the groove and on the tongue in making up joints, and the joints shall be coupled in accordance with the pipe manufacturer's requirement.

C. Inside annular space of concrete pipe 36-inch (900 mm) diameter (or equivalent) and larger shall have the inside annular space filled with cement mortar and troweled flush. Mortar shall consist of 1-part Portland cement and two (2) parts of plaster sand. Mortar for inside joints shall be mixed with only enough water for "dry packing."

2.08 Corrugated Metal Pipe

A. Galvanized Corrugated Metal Pipe:

1. Corrugated galvanized steel pipe with circular cross section and corrugated galvanized steel pipe with pipe-arch shape shall conform to the requirements of AASHTO M36, and as specified in MDOT Section 909.05. Helical corrugated pipe shall have a minimum of two (2) circumferential corrugations rerolled on each end of each section of pipe.

B. Polymeric Coated Corrugated Galvanized Steel Pipe:

1. Polymeric coated corrugated galvanized steel pipe with circular cross section and polymeric coated corrugated galvanized steel pipe with pipe-arch shape shall conform to the requirements of AASHTO M245, and as specified in MDOT Section 909.05. Helical corrugated pipe shall have a minimum of two (2) circumferential corrugations re-rolled on each end of each section of pipe.

C. Aluminized Type 2 Corrugated Metal Pipe:

1. Type 2 aluminized corrugated steel pipe with circular cross section and corrugated steel pipe with pipe-arch shape shall conform to the requirements of AASHTO M36, AASHTO M274, Type 2 and as specified in MDOT Section 909.05. Helical corrugated pipe shall have a minimum of two (2) circumferential corrugations re-rolled on each end of each section.

D. Corrugated Aluminum Alloy Pipe:

1. Corrugated aluminum alloy pipe with circular cross section and corrugated aluminum alloy pipe with arch-pipe shape shall conform to the requirements of AASHTO M196 and MDOT Section 909.05.

E. Joints for Corrugated Metal Pipe:

1. Joints for corrugated metal pipe shall be made by use of coupling bands. Coupling bands shall be of the same material as specified for the pipe and shall prevent infiltration of the side fill material. Coupling bands shall be corrugated to match the corrugations of the pipe to be jointed, and shall include two (2) "O" ring neoprene gaskets for each joint. Dimple bands shall not be used.

2. Joints shall be wrapped with a 3 foot (1 m) wide geotextile filter fabric centered on the joint.

3. When called for in the Contract Documents, joints shall have bell and spigot coupling system and rubber gasketed joint.

2.09 Dual Wall Corrugated PVC Pipe – Smooth Interior

A. Pipe shall be a single extrusion of PVC with smooth interior and corrugated outer walls. Corrugated outer profile shall be annular and seamless. Pipe and fittings shall be in accordance with ASTM F949. Joints shall be bell and spigot type with a elastomeric gasket meeting the requirements of ASTM F477 and be suitable for storm sewer service.

B. Wyes or tees shall be a molded wye or tee fitting per ASTM F949, with gasketed joints on each end suitable for directly inserting in the mainline pipe. Branch connection fitting shall be a gasketed joint suitable for the house lead pipe specified. Saddle connections are not allowed.

C. Acceptable manufacturers of Dual wall corrugated pipe include Contech A2000, Uponor ETI Ultra-Corr or ENGINEER approved equal.

2.10 Corrugated Polyethylene Pipe

A. Smooth-Lined Corrugated Polyethylene Pipe:

1. Smooth lined corrugated polyethylene pipe shall meet the requirements of MDOT section 909.06 and AASHTO M252, Type S for sizes 4” to 10” diameter, and AASHTO M294 Type S for 12” to 48” diameter.

2. Fittings shall conform to the corresponding pipe specification and be constructed of the same material classification as the pipe. Fittings shall be welded on the interior and exterior at all junctions.

3. Joints shall be bell & spigot type with rubber gaskets on both sides of the joint conforming to MDOT section 909.03 and ASTM F477. Split collar couplers are not allowed. Joints shall be watertight meeting the performance requirements of ASTM D3212.

B. Corrugated Plastic Edge Drain / Underdrains:

1. Corrugated plastic tubing for edge drains or underdrains shall meet the requirements of AASHTO M252 for polyethylene tubing. Pipe shall be wrapped in a Geotextile Pipe Wrap per MDOT Section 910.03.A.

2.11 Smooth Plastic Pipe

A. Smooth plastic pipe for underdrains shall be polyvinyl chloride PVC meeting the requirements of AASHTO M278. Pipe shall be wrapped in a Geotextile Pipe Wrap per MDOT Section 910.03.A.

2.12 Structural Plates for Field Assembly of Pipe, Pipe-Arches, and Arches

A. Plates, bolts and nuts to be used in field assembled circular pipe, pipe-arches and arches shall meet all applicable requirements of AASHTO M167 and as specified in MDOT Section 909.

2.13 End Sections

A. Precast concrete end section shall conform to ASTM C76, Class II and as specified in MDOT Section 909.04. Joint for connection to pipe shall be by means of a standard tongue and groove with cold-applied pipe joint sealer. See Article 2.07 of this Section for requirements for the cold-applied pipe joint sealer.

B. Metal end sections shall conform to MDOT 909.05. See Article 2.08 for requirements for joints.

2.14 Storm Structures

A. Materials for storm sewer structures shall conform to the requirements indicated on the Plans and as specified below.

1. Concrete Brick:

   a. Concrete brick shall be ASTM C55, Grade S-II, solid units of nominal 3-inch (75 mm) thickness.

2. Concrete Block:

   a. Block shall conform to ASTM C139, manufactured of Portland cement conforming to ASTM C150, Type II.

   b. Blocks shall be solid curved blocks with the inside and outside surfaces parallel and curved to the required radii.

   c. Blocks shall have a groove or other approved type of joint at the ends.

   d. Blocks intended for use in the cones or tops of manholes shall have such shape as may be required to form the structure as indicated on the Plans.

3. Precast Concrete:

   a. Precast concrete manhole base, cone and riser units shall conform to ASTM C478, and shall be circular with circular reinforcement. For manhole depths to 32 feet (9.7 m), the wall thickness of the sections shall be five (5) inches (125 mm).

   b. Joints on precast sections shall be the same as the joints on storm sewer.

   c. Precast concrete manhole tee units shall conform to ASTM C76, Class IV and shall be circular with circular reinforcement. Shop Drawings shall be provided for all manhole tees.

   d. Joints on the precast manhole tee shall be the same as the joints on the storm sewer section.

   e. Precast concrete base, top slab, and grade ring units shall conform to ASTM C478.

4. Manhole Steps:

a. Cast iron manhole steps shall conform to ASTM A48, Class 30, gray iron with a minimum cross section dimension of 1-inch (25 mm) in any direction.

b. Steel reinforced plastic steps shall be of suitably approved co-polymer polypropylene conforming to ASTM D4101, PP0344B33534Z02 with 1/2 inch (12 mm) minimum diameter deformed reinforcing bar conforming to ASTM A615, Grade 60.

c. Manhole steps shall be of the type and size indicated on the Plans and shall comply with applicable occupational safety and health standards. Manhole steps shall be installed at locations indicated on the Plans.

5. Frames and Covers:

a. Frames and covers for manholes, catch basins, and inlets shall conform to ASTM A48, Class 30, gray iron and shall be of the types and sizes as indicated on the Plans.

b. Castings shall be neatly made and free from cracks, holes and other defects. Surfaces of casting shall be ground to assure proper fit and to prevent rocking.

2.15 Concrete

A. In accordance with MDOT Section 701, use Grade S2; 3,500 psi (24 MPa) strength; Type IA cement; 6.0 sacks cement per cubic yard (335 kg/m^3); 6A coarse aggregate; 2NS fine aggregate; 6.5% ± 1.5% air content; 3-inch (75 mm) maximum slump; no admixtures without ENGINEER's approval.

2.16 Concrete Reinforcement

A. In accordance with MDOT Section 905, use ASTM A615, Grade 60 for bars and ASTM A185 for welded wire fabric.

Part 3 Execution

3.01 Verification of Excavation and Bedding

A. Prior to the installation of any storm sewer piping, structures, or materials, examine trenches and other excavations for the proper grades, lines, levels and clearances required to receive the new Work. Ascertain that excavation bottoms, compacted subgrades and pipe bedding are adequate to receive the storm sewer materials to be installed. Correct defects and deficiencies before proceeding with the Work.

3.02 Existing Storm Sewers and Drains

A. Expose the existing storm sewer and structures to which the new Work is to be connected and notify ENGINEER of same. ENGINEER will verify the vertical and horizontal locations of the existing system and shall inform CONTRACTOR as to the necessary adjustments required to align the new storm sewer Work with the existing system.

3.03 Preparation

A. Outside surface of the spigot end and the inside surface of the bell end of the pipe shall be cleaned and free of any foreign materials, other than the sealant recommended by the manufacturer, prior to installation.

B. Pipe, frames, covers, accessories, and appurtenances shall be examined carefully for damage and other defects immediately prior to installation. Defective or damaged material shall be rejected and removed from the Project by CONTRACTOR.

3.04 Installation - General

A. Each section of pipe, when placed to grade and line, shall have firm bearing on the trench bedding throughout its length.

B. Cutting of pipe shall be done with approved tools and by approved methods suitable for the pipe material. Pipe cutting methods that produce a smooth, square-cut end without damage to the pipe and that minimize air-borne particles, shall be employed. Pipe cutting shall be performed using the recommendations of the manufacturer of the type of the pipe materials being cut and according to the best trade practices. When cutting pipe, care shall be taken to prevent damage to the interior and exterior surfaces. Damage to either shall be cause for rejection of a complete section of pipe.

C. During the preparation of the pipe bedding and until the trench has been satisfactorily backfilled, the trench shall be kept free of water. A dewatering system, in accordance with Section 31 2319, Dewatering, shall be provided and maintained by CONTRACTOR. Dewatering system shall remain in operation until the trench is backfilled.

D. Backfill shall be as indicated on the Plans and as specified in Section 31 2333, Trenching and Backfilling.

3.05 Pipe Laying

A. Installation of pipe shall conform to ASTM C12, and as recommended by the pipe manufacturer.

B. Pipe shall be protected during handling against impact shocks and free fall. Hooks shall not be permitted to come in contact with premolded joint surfaces.

C. Pipes having pre-molded joint rings or attached couplings shall be handled so that no weight, including the weight of the pipe itself, will bear on or be supported by the jointing material. Care shall be taken to avoid dragging any pipe on the ground or allowing it to be damaged by contact with gravel, crushed stone, or other hard objects.

D. Pipe shall be laid to the line and grade called for on the Plans. Each pipe as laid, shall be checked by CONTRACTOR with line and grade pole or laser system to insure that this result is obtained. When employing a laser system, CONTRACTOR shall have an independent and alternate means of checking the line and grade. Finished work shall be straight and shall be sighted through between manholes.

E. Construction shall begin at the outlet end and proceed upgrade with spigot ends pointing in direction of flow. Bell holes shall be excavated so that the full length of the barrel will bear uniformly on the bedding material.

F. Lubricants, primers or adhesives as recommended by the pipe or joint manufacturer shall be used immediately prior to jointing.

G. Pipe shall be centered in the bells or grooves and pushed tight together to form a smooth and continuous invert. After laying of pipe, care shall be taken so as not to disturb its line and grade. Pipes found off grade or out of line shall be re-laid properly by CONTRACTOR.

H. Mechanical means shall be used for pulling home pipe where manual means will not result in pushing and holding the pipe home. Mechanical means shall consist of a cable placed inside of the pipe with a suitable winch, jack, or come along for pulling the pipe home and holding the pipe in position.

I. Circular concrete pipe with elliptical reinforcement shall be installed with the lift holes to the top of the pipe. Manufacturer's marks designating the top and bottom of the pipe shall not be more than five degrees from the vertical plane through the longitudinal axis of the pipe. After the pipe is installed, the lift holes shall be sealed with suitable concrete plugs.

J. Type "HE" elliptical pipe shall be installed with the longer axis placed horizontally within a tolerance of plus or minus five degrees ($\pm 5^{o}$).

K. Type "VE" elliptical pipe shall be installed with the longer axis placed vertically within a tolerance of plus or minus five degrees ($\pm 5^{o}$).

3.06 Pipe Bedding

A. After the bottom of trench has been excavated the pipe bedding material will be installed in accordance with Section 31 2333, Trenching and Backfilling. Pipe shall then be installed strictly in accordance with the manufacturer's recommendations. After the pipe is laid, the bedding shall be continued above the pipe as specified in Section 31 2333, Trenching and Backfilling. Particular care shall be taken to assure filling and tamping spaces under, around and above the top of the pipe.

B. A continuous and uniform bedding as specified in Section 31 2333, Trenching and Backfilling, shall be provided in the trench for buried pipe.

3.07 Underdrains

A. Pipe shall be laid in close conformity with the lines or grades shown on the Plans or established by ENGINEER. The upgrade ends of all underdrains shall be closed with suitable plugs to prevent entry of soil or other foreign material.

B. Perforated pipe shall be laid with the perforations down.

C. Underdrains shall be bedded in MDOT open graded drainage course material. Bedding shall have a minimum thickness beneath the pipe of four (4) inches (100 mm), a minimum width of six (6) inches (150 mm) on each side of the pipe and extend to a level not less than 12 inches (300 mm) above the top of the pipe.

D. Bedding shall be placed equally on both sides of the underdrain at the same time. Staking or other methods to restrain the pipe may be necessary during the backfilling operation to maintain the line and grade of the underdrain.

E. Rodent screens and outlet endings are required for all underdrains which terminate in a ditch or swale.

3.08 Storm Structures

A. Construct storm sewer manholes, catch basins, inlets and other structures to the grades, lines and levels indicated on the Plans and as specified. Structures shall be complete with concrete bases, reinforcing, frames, covers, adjustment bricks, etc., as shown and as required for a complete installation. Storm sewer structures shall conform to the type of material and dimensions indicated on the Plans.

B. Cast-in-place structures shall be constructed in accordance with Section 03 3000, Cast-In-Place Concrete.

C. Block Structures:

1. Construct concrete block structures in the locations and according to the details on the Plans. The first course of concrete blocks shall be placed on the prepared base or footings in a full bed of mortar. Mortar joints shall be full and close in all courses. Courses shall be level throughout. Stagger joints in adjoining courses by one-half the length of the block as nearly as practicable. Joints shall be uniform in thickness throughout the structures. Strike all joints and properly point to provide true, smooth surfaces.

D. Precast Concrete Structures:

1. Construct precast concrete structures as detailed on the Plans. Provide mortar joints struck smooth. Provide three (3) to five (5) courses of 8-inch (200 mm) brick or concrete grade rings at top of structure for future adjustment of castings.

E. A cement mortar plaster coat shall be applied to the exterior surfaces of the brick and block sections of all storm structures as indicated on the Plans. Plaster coat shall be 1/2 inch (10 mm) thick.

F. Provide and install all frames and covers to the elevations indicated on the Plans. Castings shall be set in a full bed of cement mortar 1/2 inch (10 mm) thick, minimum. Mortar joints shall be struck smooth.

G. Steps shall be installed at the plant by the manufacturer of precast units. Field install steps for brick, block, or cast in place structures of the types and in the locations indicated on the Plans.

H. Pipe up to 42 inches (1050 mm) in diameter, shall be connected to storm structures using a grouted joint, as indicated on the Plans. The pipe shall be properly supported, so that any settlement will not disturb the connection.

I. For pipe, 48 inches (1200 mm) in diameter or larger, the pipe shall be installed as an integral part of the manhole which shall be constructed of 3,500 psi (24 MPa) concrete and reinforcing, as indicated on the Plans.

J. Manhole tees, as indicated on the Plans, may be used for pipe 42 inches (1050 mm) in diameter or larger. Connection to manhole tees shall be made using tees and pipe having the same type of joint. The pipe and tee shall be properly supported with concrete as indicated on the Plans.

K. Sump shall be provided, as indicated on the Plans, in all catch basins and storm manholes having outlets of 18 inches (450 mm) in diameter or less.

L. Flow channels shall be constructed in all structures not requiring a sump and shall be constructed as indicated on the Plans.

3.09 Field Quality Control

A. After all the pipe and structures have been laid, constructed and backfilled, the system shall be final inspected. The sewer system shall be ready for the final inspection within two (2) weeks after the completion of each 2,000-foot (600 m) section of sewer installed.

B. Final inspection shall consist of a visible and audible check of the sewers and structures to ascertain that the steps have been placed, lift holes jointed, the channeling of the manhole bottoms completed, visible or audible leaks stopped, pipe has been placed straight and true to the proper slopes and elevations, the required brick courses for adjustment, the frame and cover properly installed, the required end section installed, trenches and structures backfilled in a workmanlike manner and that the system has been thoroughly cleaned.

C. The final inspection shall be considered complete when all the repairs have been made.

3.10 Deflection Test for Plastic Pipe

A. Plastic pipe shall be tested for deflection, but no sooner than 30 days following the backfilling of the pipe.

B. Maximum allowable deflection (reduction in vertical inside diameter) shall be five (5) percent.

C. Locations with excessive deflection shall be excavated and repaired by re-bedding and/or replacement of the pipe.

D. Optional devices for testing include a deflectometer, calibrated television or photography, or a properly sized "go, no-go" mandrel or sewer ball. Mandrel shall have a minimum of nine (9) legs.

3.11 Remove Storm Sewer

A. Excavate and remove the existing storm sewer where indicated on the plans. Bulkhead the opening in storm sewers or structures where the existing storm sewer has been removed. Where removal of existing storm sewer is occurring in essentially the same location as a new sewer or structure, the removal of the existing sewer is incidental to the project.

3.12 Remove Culverts

A. Excavate and remove culverts where indicated on the plans. Backfill the completed work as specified under “Backfilling Trenches” in Section 31 2333, Trenching and Backfilling.

3.13 Remove Structure

A. Excavate and remove structures where indicated on the plans. Bulkhead the ends of any sewers remaining in place. Backfill the completed work as specified under “Backfilling Trenches” in Section 31 2333, Trenching and Backfilling. Removal of existing storm structures is incidental to the project if a new structure or sewer is being constructed in essentially the same location.

3.14 Remove and Replace Storm Sewer

A. Remove and replace storm sewer shall consist of the complete removal and disposal of the existing sewer and replacement with the size and type of sewer as called for on the plans or specified. All materials and installation shall be in accordance with the requirements of this section and Section 31 2333, Trenching and Backfilling, as applicable.

3.15 Remove and Replace Storm Structure

A. Remove and replace storm structure shall consist of the complete removal and disposal of the existing structure and replacement with the size and type of structure as called for on the plans or specified. Materials and installation shall be in accordance with the requirements of this section and Section 31 2333, Trenching and Backfilling, as applicable.

End of Section

Section 33 4400
Storm Utility Water Drains

Part 1 General

1.01 Scope of Work

A. This Section includes open drain construction complete with excavation and disposal of excavated material, backfilling and grading of abandoned open drains, maintaining overland drainage and cleanout of existing open and enclosed drains.

1.02 Related Work Specified Elsewhere

A. Section 31 2198: Site Construction Performance Requirements
B. Section 31 2199: Temporary Erosion and Sediment Control
C. Section 31 1100: Clearing and Grubbing
D. Section 31 2200: Grading
E. Section 31 2316: Structural Excavation and Backfill
F. Section 31 2319: Dewatering
G. Section 31 3500: Slope Protection
H. Section 32 9219: Seeding
I. Section 32 9223: Sodding
J. Section 33 4100: Storm Utility Drainage Piping

1.03 Allowable Tolerances

A. Areas to be excavated shall be trimmed and dressed to conform to the lines, grades and cross sections shown on the Plans within the following tolerances:

B. Finished surface elevation of all channel bottoms shall be within ± 1-inch (25 mm) of Plan elevation.

C. Finished surface elevation of all channel areas, other than the channel bottoms, shall be within plus or minus two (2) inches (50 mm) of Plan elevation.

1.04 Job Conditions

A. Trees, shrubs and other types of vegetation not within the Work limits designated on the Plans or by ENGINEER shall be carefully protected from damage or injury during the entire drain construction operation.

B. Trees, shrubs, or other types of vegetation not designated to be removed but which are damaged by CONTRACTOR's operation shall be replaced by CONTRACTOR. Costs incurred shall be incidental to the open drain construction operation.

C. Existing buildings, fences, culverts, drain tile, utility poles, overhead lines, underground conduits, underground cables, sewers, structures, or other types of improvements within the drain right-of-way limits not designated on the Plans to be removed, shall be carefully protected from damage during the drain construction operation.

D. Existing structures or improvements not designated to be removed, but which damaged by CONTRACTOR's operation, shall be repaired or replaced by CONTRACTOR. Costs incurred shall be incidental to the drain construction operation.

Part 2 Products (Not Used)

Part 3 Execution

3.01 Performance - General

A. Construction shall begin at the outlet end of the open drain and proceed upstream, unless otherwise authorized by ENGINEER.

B. Prior to the commencing of excavation or cleanout of the open drain and until the satisfactory completion of the open drain construction operation, the drain shall be kept free of water. A dewatering system shall be provided and maintained by CONTRACTOR as specified in Section 31 2319, Dewatering.

3.02 Disposal Areas

A. If disposal areas for unsuitable materials are not specified on the Plans, CONTRACTOR, at his expense, shall furnish and maintain a disposal area. Spoil disposal areas that may be designated on the Plans are not for disposal of unsuitable materials unless otherwise specified on the Plans or as determined by ENGINEER.

3.03 Clearing and Grubbing

A. Drain right-of-way and spoil deposit areas, designated on the Plans or as determined by ENGINEER, shall be cleared and grubbed prior to actual excavation of the open drain as provided for in Section 31 1100, Clearing and Grubbing.

B. Along the open drain, the clearing and grubbing Work shall precede the excavation operation by at least a 1/2 mile (800 m).

C. Clearing and grubbing shall consist of preparing an area for excavation or fill by removing unsuitable materials and vegetation which interferes with the proposed Work, and shall include the preservation from injury or defacement of material ground cover, trees, and other vegetation and improvements designated to remain.

D. Clearing and grubbing operations, including removal and disposal of unsuitable materials, shall be considered incidental to the Project and shall be considered part of the excavation pay item.

3.04 Removing and Salvaging Topsoil

A. Topsoil shall be salvaged in an amount equivalent to the quantity required for the Work specified on the Plans or as designated by ENGINEER.

B. Topsoil in excess of the required amount, will be disposed of at CONTRACTOR's expense.

C. When additional topsoil is required to complete the drain construction operation, CONTRACTOR, at his expense, shall furnish, place, and spread the additional topsoil.

D. Vegetation shall be cut to a height of approximately two (2) inches (50 mm) and topsoil shall be free of foreign materials prior to removal. Topsoil shall be removed in such a manner as to avoid the lifting of subsoils. Topsoil shall be removed within the grading limits for cuts, and shall be removed to width and depth as specified on the Plans or as directed by ENGINEER.

E. Topsoil shall be stockpiled within the drain right-of- way, outside of the construction area. Topsoil shall be stockpiled separate from other excavated materials to be used for embankments or subject to disposal. Topsoil shall be located as near the original location as possible, as no payment will be made for overhauls. Topsoil shall be stockpiled at locations so as to avoid placing the material around tree trunks or over root systems of trees to be preserved.

F. Cost of topsoil removal, stockpiling, hauling, spreading and grading shall be considered incidental to the Project.

3.05 Excavation

A. Open drains shall be excavated to the lines, grades, dimensions and cross sections specified on the Plans.

B. Excavation shall consist of the removal and disposal of all materials necessary to construct the open drain. Material removed shall be placed in suitably prepared spoil disposal areas. If spoil disposal areas are not specified on the Plans, CONTRACTOR, at his expense, shall provide and maintain a disposal area.

C. Construction, excavation and disposal operations shall be performed in such a manner and sequence that adequate drainage will be maintained at all times.

D. When wet or unstable soil conditions are encountered during the excavation operation, CONTRACTOR shall immediately cease operations and notify ENGINEER. At the approval of ENGINEER, CONTRACTOR, in addition to dewatering, may make changes in the Work to facilitate the dewatering and stabilizing of the soils. Cost incurred for dewatering and stabilizing the soils shall be at CONTRACTOR's expense.

E. When indicated on the Plans or when wet or unstable soils are encountered, the initial construction of the drain shall be excavation of a pilot channel no less than 30 days in advance of completing final drain side slopes. ENGINEER will determine when drain slopes have stabilized sufficiently to allow for final slope shaping.

F. Pilot channel excavation shall have a bottom width of approximately one-half the proposed final width with 1:1 side slopes and shall be excavated to the elevations indicated on the Plans. Pilot channel shall not be excavated upstream from any bridge requiring bridge protection work or replacement until the scheduled work for such bridge has been completed, unless otherwise approved by ENGINEER.

G. When stones, boulders, or rocks are encountered during the excavation, they shall be removed and disposed of as unsuitable material. After the stones, boulders, or rocks have been removed, any holes or voids created, which continue below the Plan grade, shall be backfilled with approved materials, and compacted, to the satisfaction of ENGINEER.

H. When ledge rock is encountered, CONTRACTOR shall immediately cease operations and notify ENGINEER of his findings.

I. Costs incurred for removal and disposal of stones, boulders, and rocks in addition to backfilling and compaction shall be at CONTRACTOR's expense.

J. Blasting will not be permitted, unless otherwise specified on the Plans or at the approval of ENGINEER.

3.06 Grading Requirements

A. Channel areas receiving a slope protection as specified on the Plans, shall be excavated to a depth sufficient to provide for installation of the protective materials, meeting the finished surface grade tolerances.

B. Additional excavation necessary to provide for slope protection shall be considered incidental to the cost of the Project.

C. In areas where CONTRACTOR over excavates, the over excavation area shall be backfilled with approved materials and compacted at CONTRACTOR's expense.

D. Grades shall be finished in a condition satisfactory to ENGINEER immediately prior to the placement of slope protective materials.

E. Trimming and finishing the earth grade will be considered incidental to the excavation.

3.07 Soil Erosion and Sedimentation Control

A. CONTRACTOR, at his expense, shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by ENGINEER.

B. Measures shall prevent surface runoff from carrying excavated materials into the drain, to reduce erosion of the slopes, and to prevent silting in of drain downstream of the Work.

C. Measures should include provisions to reduce erosions by the wind of areas stripped of vegetation, including material stockpiles.

D. Comply with requirements of Section 31 2199, Temporary Erosion and Sediment Control.

3.08 Slope Stabilization

A. After completion of the grading operation, and prior to the placing on any protective covering, ENGINEER shall inspect the slopes for any signs of internal water movement as indicated by seepage and soil slippage, and for the existence of unstable slope conditions.

B. CONTRACTOR shall take the necessary measures to stabilize the slopes including removal and disposal of unsuitable or unstable materials, the backfilling with approved material, and compaction. Cost incurred for slope stabilization shall be considered incidental to the excavation.

3.09 Spoil Disposal Areas

A. Excavation, free from unsuitable materials shall be deposited in approved spoil disposal areas, as specified in Section 01 8900, Site Construction Performance Requirements.

B. Depositing of spoil materials in existing watercourses or drains shall be prohibited, unless otherwise specified on the Plans. Spoil material shall be deposited, compacted and graded to provide drainage. Swales shall be constructed when necessary to provide positive drainage to drain.

3.10 Culverts

A. New culverts or culverts to be relayed as indicated on the Plans shall be installed as required in Section 33 4100, Storm Utility Drainage Piping. Special care shall be taken in removing, salvaging, storing, handling or placing culverts so that they are not damaged.

B. Only culverts meeting the approval of ENGINEER may be relayed.

C. Culverts having the protective coating scraped or otherwise damaged, shall be repaired by CONTRACTOR, at his expense, to the satisfaction of ENGINEER.

D. Corrugated steel pipe, when specified, will be layed with the outside laps of circumferential joints pointing upstream and with longitudinal laps at the sides at about the vertical mid-height of the culvert.

E. When existing culverts are to be relayed, the inverts shall be rotated 180 degrees.

F. CONTRACTOR shall make arrangements with the land owner and/or land user for the removal of culverts. CONTRACTOR shall provide ENGINEER with a copy of the arrangements made, bearing the signature of the landowner and/or land user.

G. Culverts removed and not relayed shall be disposed of by CONTRACTOR, at his expense.

H. Culverts which are removed shall be relayed, when specified, at the culvert crossing from which they were removed. Salvaged culverts shall not be used at any other location, unless otherwise authorized by ENGINEER.

3.11 Tile Outlets

A. CONTRACTOR shall contact existing landowners and land users to locate and flag the location of all known tile outlets to be protected during the excavating operation.

B. CONTRACTOR shall not proceed with the Work until the tile outlet locations have been so marked.

C. CONTRACTOR will be responsible for leaving the tile outlets in good repair and in working order.

D. It may become necessary to shorten the length of existing tile outlets and recess them back into the newly shaped slope. This Work shall be considered incidental to the Project.

E. When called for on the Plans new outlets shall be installed and shall conform to the materials specified. A suitable rodent guard shall be furnished and placed on the end of new outlet, at CONTRACTOR's expense. Existing rodent guards shall be relocated by CONTRACTOR, and this Work shall be considered incidental to the Project.

F. When it is apparent a tile outlet is carrying human or animal waste material from a home or barnyard area, CONTRACTOR will request the County Health Department approval before reconnecting the outlet to the drain.

3.12 Bridges

A. Existing bridges shall be removed and disposed of, or shall be removed, salvaged and reinstalled, as specified on the Plans. Care shall be taken when removing, salvaging, storing, handling and installing the existing bridge.

B. CONTRACTOR shall make arrangements with the landowner and/or land user for the removal of the bridge. CONTRACTOR shall provide ENGINEER with a copy of the arrangements made, bearing the signature of the landowner and/or land user.

3.13 Cleanout of Drain

A. Cleanout of the existing drain shall include the clearing and grubbing of all trees, brush, stumps and other vegetation in accordance with Section 31 1100, Clearing and Grubbing. Excavation shall be in accordance with Article 3.05 of this Section.

B. Enclosed drain cleanout shall include the complete removal and disposal of all sediment, silt, dirt, debris and other miscellaneous items to the bottom of the culvert or to the elevation shown on the plans, or as determined by ENGINEER.

C. At the completion of the cleanout CONTRACTOR shall restore areas disturbed with topsoil, seed, fertilizer and mulch, or topsoil and sod.

End of Section

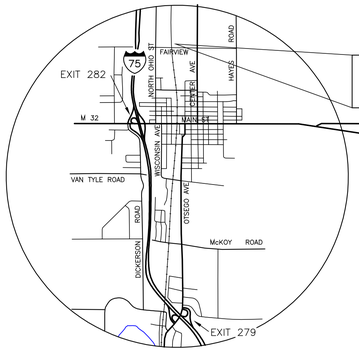
BID 2011-08 ANIMAL CONTROL FACILITY
Architectural Plans

PROPOSED NEW ANIMAL CONTROL FACILITY

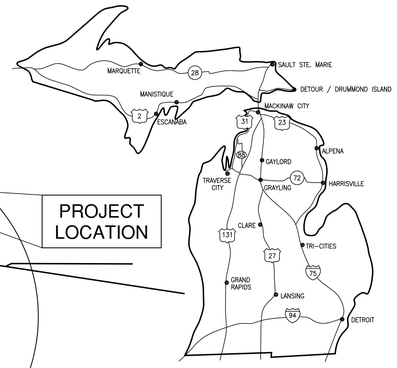
FOR

OTSEGO COUNTY

GAYLORD MICHIGAN



CITY of GAYLORD



LOCATION MAP

CONTRACTOR

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C-0.2	GENERAL NOTES PLAN
C-1.0	EXISTING CONDITIONS PLAN
C-2.0	SWPP PLAN
C-2.1	SWPP DETAILS PLAN
C-3.0	SITE PLAN
C-3.1	SITE DETAILS PLAN
C-4.0	GRADING PLAN
C-4.1	GRADING NOTES PLAN
C-5.0	UTILITIES PLAN
C-5.1	UTILITIES DETAILS PLAN
C-5.2	UTILITIES DETAILS PLAN
ES-1.0	ELECTRICAL SITE PLAN
L-1.0	LANDSCAPE PLAN
L-1.1	LANDSCAPE DETAILS & NOTES PLAN
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A2.1	EQUIPMENT PLAN and ELEVATIONS
A2.2	EQUIPMENT ELEVATIONS / MILLWORK DETAILS
A3.1	REFLECTED CEILING PLANS
A4.1	EXTERIOR ELEVATIONS
A5.1	ROOM FINISH SCHEDULE / 1/4" PLANS and INTERIOR ELEVATIONS
A5.2	DOOR SCHEDULE, DOOR/FRAME ELEVATIONS and DETAILS
A5.3	DOOR HEAD, JAMB AND SILL DETAILS
A6.1	BUILDING SECTIONS
A6.2	BUILDING SECTIONS
A6.3	BUILDING SECTIONS
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S1.1	FOUNDATION PLAN and DETAILS
S2.1	WALL / FLOOR FRAMING PLANS
S3.1	ROOF FRAMING PLAN and DETAILS
S3.2	ROOF TRUSS PROFILES
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P3	PLUMBING DETAILS
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E2	ELECTRICAL - POWER PLAN
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E4	ELECTRICAL DETAILS

BUILDING DATA

USE AND OCCUPANCY CLASSIFICATION (IBC CHAPTER 3)
B - BUSINESS

GENERAL BUILDING HEIGHT AND AREA LIMITATIONS (IBC CHAPTER 5)
TABULAR HEIGHT LIMITATION (VB CONST): 2 STORIES
TABULAR AREA LIMITATION (VB CONST): 9,000 sf

ACTUAL BUILDING HEIGHT: 1 STORY
ACTUAL BUILDING AREA: 6,313 sf

TYPES OF CONSTRUCTION (IBC CHAPTER 6)
CONSTRUCTION CLASSIFICATION: TYPE VB

REQUIRED FIRE RESISTANCE RATINGS FOR BUILDING ELEMENTS (TABLE 601)
STRUCTURAL FRAME: 0 HOURS
BEARING WALLS (EXT): 0 HOURS
BEARING WALLS (INT): 0 HOURS
NON-BEARING WALLS AND PARTITIONS (EXT): 0 HOURS
NON-BEARING WALLS AND PARTITIONS (INT): 0 HOURS
FLOOR CONSTRUCTION: 0 HOURS
ROOF CONSTRUCTION: 0 HOURS

REQUIRED FIRE RESSITANCE RATINGS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE (TABLE 602)
X>/= 30': 0 HOURS

MAXIMUM AREA OF EXTERIOR WALL OPENINGS (TABLE 704.8)
X>/= 30': UNPROTECTED OPENINGS = NO LIMIT

PARAPETS ARE NOT REQUIRED ON EXTERIOR WALLS WHERE THE WALL IS NOT REQUIRED TO BE FIRE-RESISTANT RATED IN ACCORDANCE WITH TABLE 602 PER 704.8 (SEE 704.11 EXCEPTION 1)

FIRE SUPPRESSION SYSTEM: NONE

REQUIRED FIRE SEPARATION OF BUILDING ELEMENTS
SEPARATION OF CORRIDORS: 0 HOUR (IBC 1017.1 EXCEPTION 4)

OCCUPANT LOAD AND EGRESS WIDTH
BUSINESS AREAS (PER 1004.1.1 EXCEPTION): 24
MINIMUM NUMBER OF EXITS REQUIRED (MBC 1021.1): 2

PLUMBING FIXTURE REQUIREMENTS (MPC 403.1)

OCCUPANCY DISTRIBUTION: 12 MALE, 12 FEMALE.

WATER CLOSETS REQ'D: MEN = 1; WOMEN = 1
WATER CLOSETS PROVIDED: 2 UNISEX

LAVATORIES REQ'D: MEN = 1; WOMEN = 1
LAVATORIES PROVIDED: 2 UNISEX

DRINKING FOUNTAINS REQ'D: 2
DRINKING FOUNTAINS PROVIDED: 2

1 SERVICE SINK REQ'D
1 SERVICE SINK PROVIDED

PROJECT SIGN

SCALE: 1" = 1'-0"

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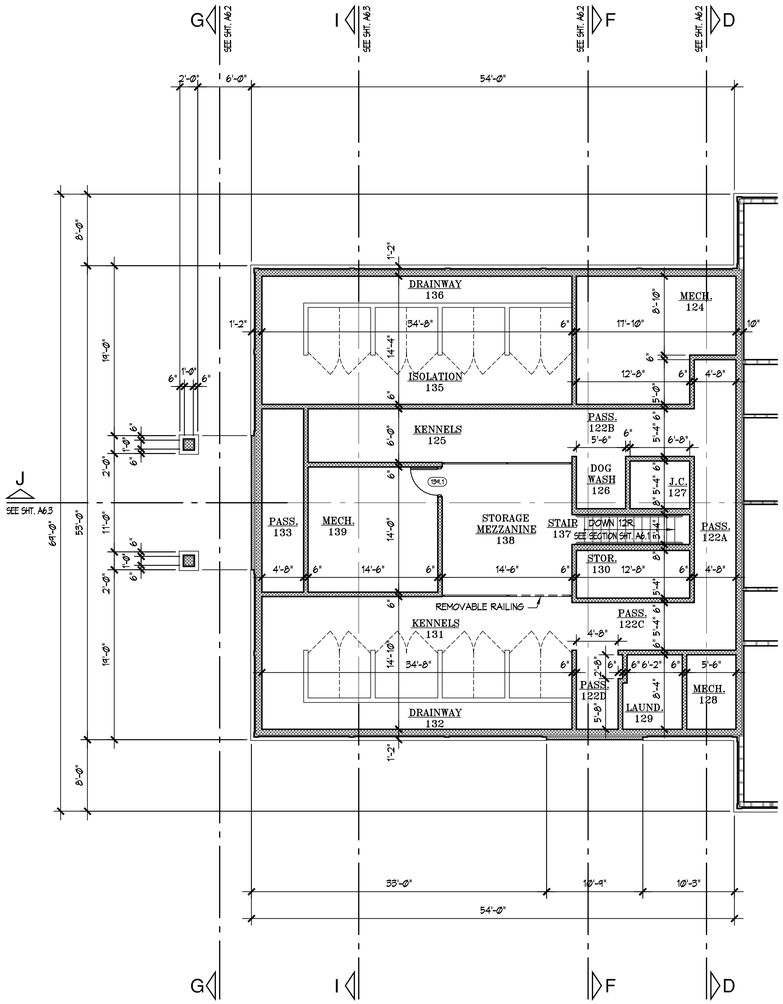
DRAWING TITLE
TITLE SHEET
PROJECT INFORMATION

PROJECT TITLE
PROPOSED NEW ANIMAL CONTROL FACILITY FOR:
OTSEGO COUNTY
GAYLORD, MICHIGAN

PROJECT NO.
0160-10

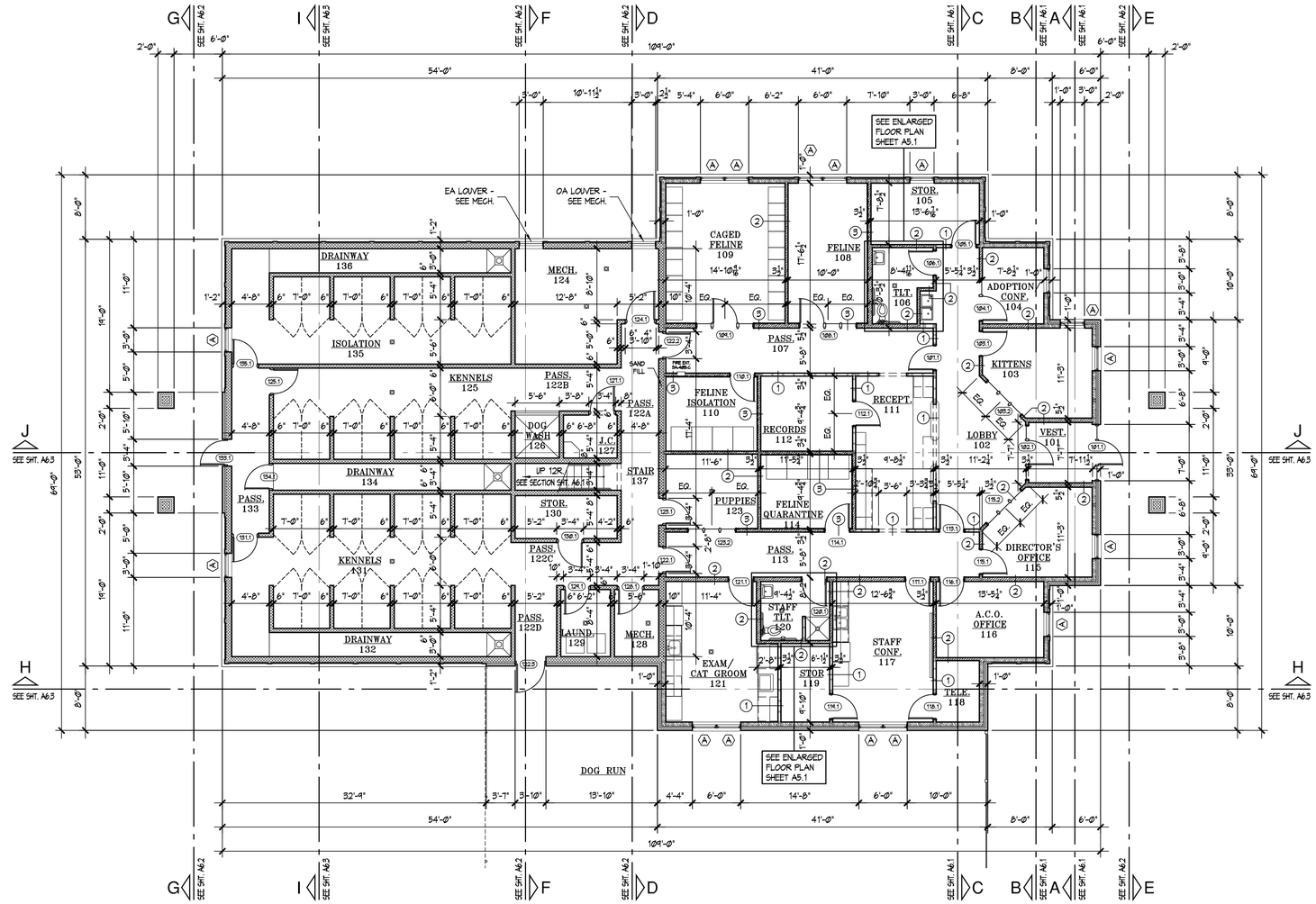
DATE
DEC. 8, 2010
APRIL 4, 2011

SHEET
T



MEZZANINE PLAN

SCALE: 1/8" = 1'-0"



FLOOR PLAN

SCALE: 1/8" = 1'-0"

DIMENSION NOTES:

EXTERIOR DIMENSIONS ARE OUTSIDE FACE OF BRICK TO OUTSIDE FACE OF BRICK.

INTERIOR DIMENSIONS OF CMU WALLS ARE FACE OF CMU TO FACE OF CMU.

INTERIOR DIMENSIONS OF WOOD STUD WALLS ARE FACE OF STUD TO FACE OF STUD.

INTERIOR DOORS LOCATED IN CORNERS OF ROOMS WITH WOOD STUD WALLS ARE 3 1/4" FROM FACE OF STUD TO EDGE OF HOLLOW METAL FRAME.

STUD PARTITION LEGEND

1. 2x4 / 2x6 WOOD STUDS AT 16" O.C. w/ 1/2" GYP. BD. EACH SIDE - EXTEND FLOOR TO BTM. OF TRUSSES.
2. 2x4 / 2x6 WOOD STUDS AT 16" O.C. w/ 1/2" GYP. BD. EACH SIDE AND 3" SOUND ATTENUATION FIBERGLASS (S.A.F.B.) BATTS - EXTEND FLOOR TO BTM. OF TRUSSES.
3. 2x4 / 2x6 WOOD STUDS AT 16" O.C. w/ (2) LAYERS 1/2" GYP. BD. OVER RC-1 CHANNELS ON TAG SIDE; 1/2" GYP. BD. OPP. TAG SIDE; AND 3" SOUND ATTENUATION FIBERGLASS BATTS (S.A.F.B.) - EXTEND FLOOR TO BTM. OF TRUSSES.

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DRAWING TITLE
FLOOR PLAN
MEZZANINE PLAN

PROJECT TITLE
PROPOSED NEW ANIMAL CONTROL FACILITY FOR:
OTSEGO COUNTY
GAYLORD, MICHIGAN

PROJECT NO. 0160-10

DATE
DEC. 8, 2010
APRIL 4, 2011

SHEET A1.1

CASEWORK SCHEDULE

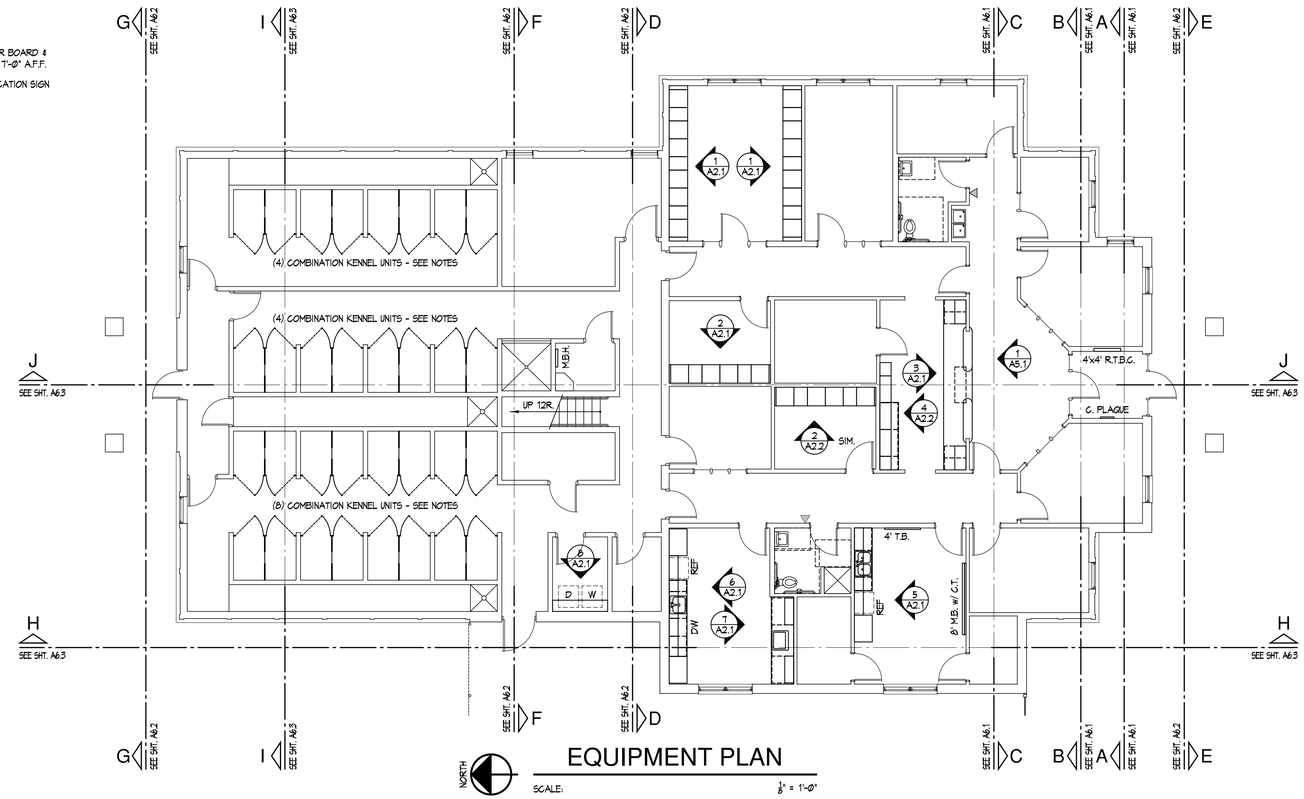
MARK	DESCRIPTION	DIMENSIONS SIZE (WxDxH)	DOORS	DRAWERS	SHELVES
B1	NOT USED				
B2	DRAWER BASE - FILE	16x24x30	0	2	0
B3	DRAWER BASE - DRAWER/FILE	16x24x30	0	3	0
B4	DRAWER BASE	18x24x34	1	1	1
B5	BASE CABINET	18x24x34	2	2	1
B6	NOT USED	24x24x34	1	1	1
B7	BASE CABINET	30x24x34	2	2	1
B8	BASE CABINET	36x24x34	2	2	1
B9	SINK BASE CABINET	36x24x34	2	N/A	0
B10	BASE CABINET	36x24x34	2	2	1
B11	SINK BASE CABINET	42x24x34	2	N/A	0
B12	SHELF BASE	48x15x30	N/A	N/A	1
W1	NOT USED				
W2	WALL CABINET	18x12x30	1	N/A	2
W3	WALL CABINET	18x15x18	1	N/A	1
W4	WALL CABINET	18x15x30	1	N/A	2
W5	WALL CABINET	24x12x30	1	N/A	2
W6	NOT USED				
W7	WALL CABINET	30x12x30	2	N/A	2
W8	WALL CABINET	32x15x30	2	N/A	2
W9	WALL CABINET	33x12x18	2	N/A	0
W10	WALL CABINET	36x12x18	2	N/A	0
W11	WALL CABINET	36x12x30	2	N/A	2
W12	WALL CABINET	36x15x18	2	N/A	1
W13	WALL CABINET	36x15x30	2	N/A	2
W14	WALL CABINET	42x12x18	2	N/A	0
W15	WALL CABINET	36x15x30	2	N/A	2
T1	TALL WARDROBE CABINET	36x24x84	2	N/A	5/1
T2	TALL STORAGE CABINET	36x24x84	2	N/A	5

ELEVATION ABBREVIATIONS

B.F.G.B.	BARRIER FREE GRAB BAR
CH.T.	CHALK TRAY
F.D.	FLOOR DRAIN
F.N.D.	FEMININE NAPKIN DISPOSAL
F.S.S.	FOLDING SHOWER SEAT
LAV.	LAVATORY
M.B.H.	MOP/BROOM HOLDER
M.B.	MARKER BOARD
MIR.	MIRROR
P.LAM	PLASTIC LAMINATE
P.T.D./D.	PAPER TOWEL DISPENSER/DISPOSAL
R/TH	ROBE/TOWEL HOOKS
T.B.	TACK BOARD
T.T.D.	TOILET TISSUE DISPENSER
S.D.	SOAP DISPENSER
S.C.R.	SHOWER CURTAIN ROD
W.C.	WATER CLOSET

NOTE: MOUNT MARKER BOARD & TACK BOARD TOP @ 7'-0" A.F.F.

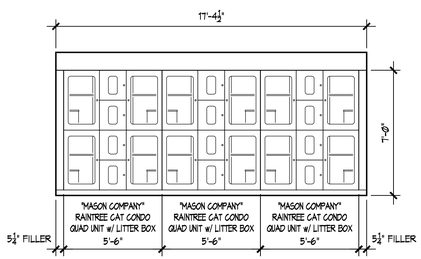
▶ ROOM IDENTIFICATION SIGN



NORTH

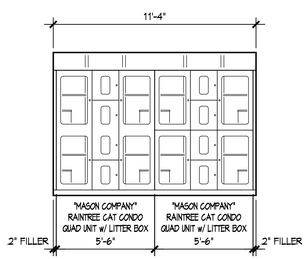
EQUIPMENT PLAN

SCALE: 1/8" = 1'-0"



1 A2.1 CAGED FELINE 109

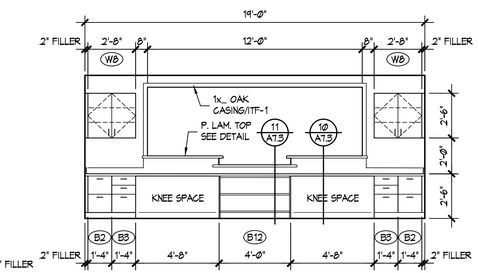
SCALE: 1/4" = 1'-0"



2 A2.1 FELINE ISOLATION 110

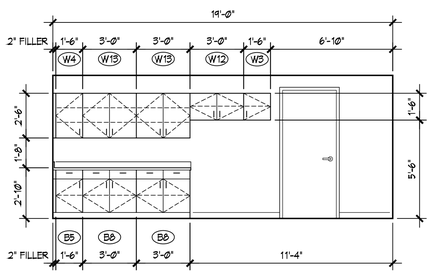
SCALE: 1/4" = 1'-0"

FELINE QUARANTINE 114 (SIM.)



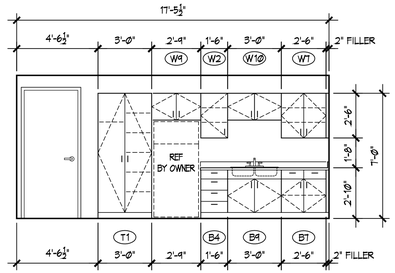
3 A2.1 RECEPTION 111

SCALE: 1/4" = 1'-0"



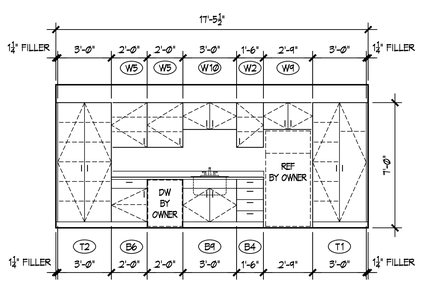
4 A2.1 RECEPTION 111

SCALE: 1/4" = 1'-0"



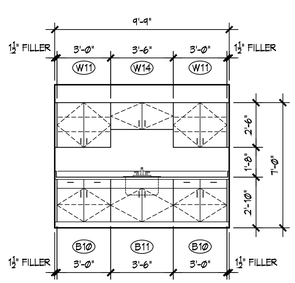
5 A2.1 STAFF CONF. 117

SCALE: 1/4" = 1'-0"



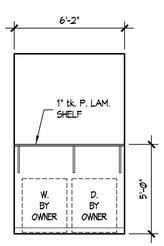
6 A2.1 EXAM / GROOM 121

SCALE: 1/4" = 1'-0"



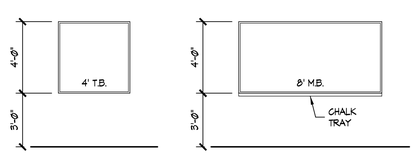
7 A2.1 EXAM / GROOM 121

SCALE: 1/4" = 1'-0"



8 A2.1 LAUNDRY 129

SCALE: 1/4" = 1'-0"

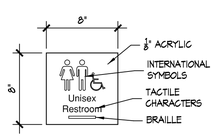


VISUAL DISPLAY BOARD ELEVATIONS

SCALE: 1/4" = 1'-0"

SIGN SCHEDULE

SIGN TAG	SIGN TYPE	SIGN INFORMATION		
		ROOM NO.	ROOM IDENTIFICATION	PICTOGRAM
1	A	-	Unisex Restroom	
2	A	-	Staff Restroom	



TYPE "A"

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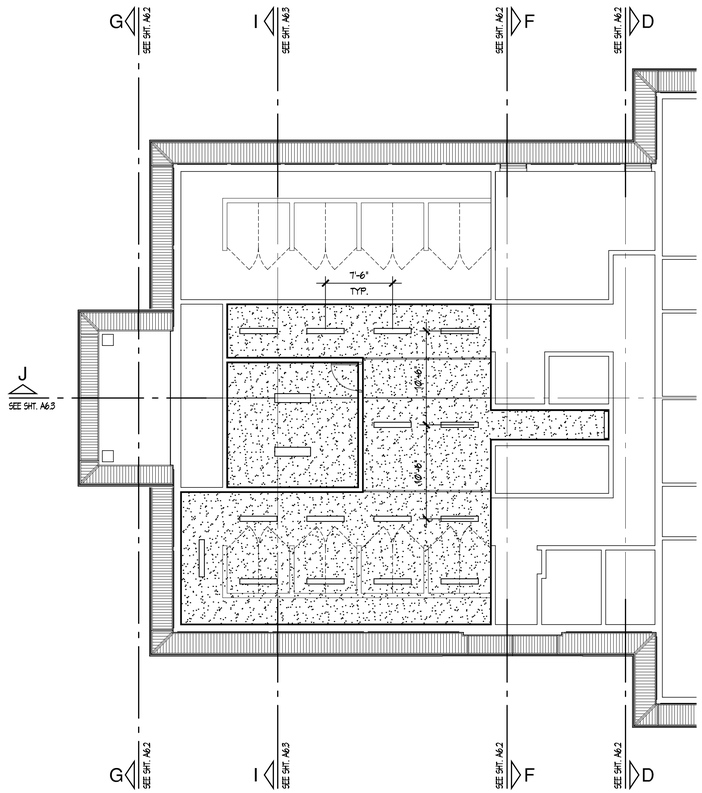
DRAWING TITLE: EQUIPMENT PLAN and ELEVATIONS

PROJECT TITLE: PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY, GAYLORD, MICHIGAN

PROJECT NO. 0160-10

DATE APRIL 4, 2011

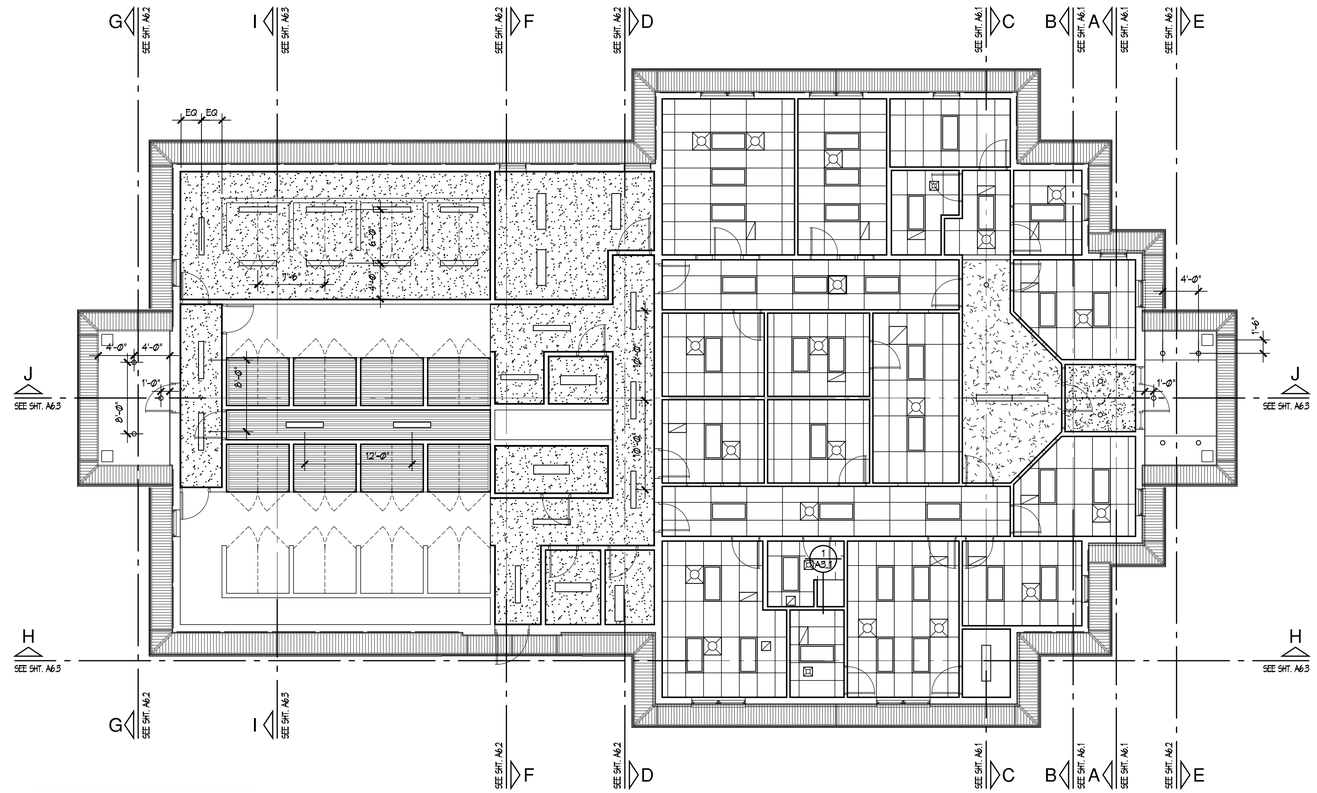
SHEET A2.1



MEZZANINE REFLECTED CEILING PLAN

NORTH

SCALE: 1/8" = 1'-0"

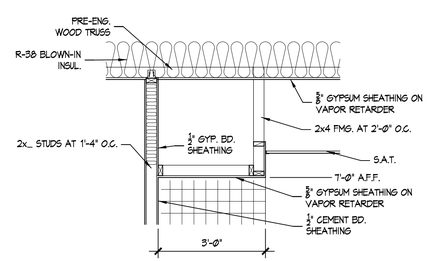


NOTE: FIXTURES NOT MOUNTED IN SUSPENDED CEILING GRID ARE TO BE INSTALLED PARALLEL TO THE LINES OF THE BUILDING. FIXTURES AND/OR GROUPED OF FIXTURES ARE TO BE INSTALLED SYMETRICALLY ABOUT THE CENTERLINES OF THE ROOM UNLESS DIMENSIONED OTHERWISE.

REFLECTED CEILING PLAN

NORTH

SCALE: 1/8" = 1'-0"



SHR. SOFFIT DETAIL

A3.1

SCALE: 1" = 1'-0"

LEGEND

S.A.T.-1	SUSPENDED ACOUSTICAL TILE #1 MINERAL FIBER ACOUSTIC PADS		H.V.A.C. DIFFUSERS & GRILLES - SEE MECHANICAL PLANS
S.A.T.F.	SPRAYED-ON ACOUSTICAL FINISH (K-13)		LIGHT FIXTURES SEE ELECTRICAL PLANS
S.T.F.	SPRAYED-ON TEXTURED FINISH		ATTIC ACCESS DOOR
	GYPSUM BOARD w/KNOCK-DOWN FINISH		

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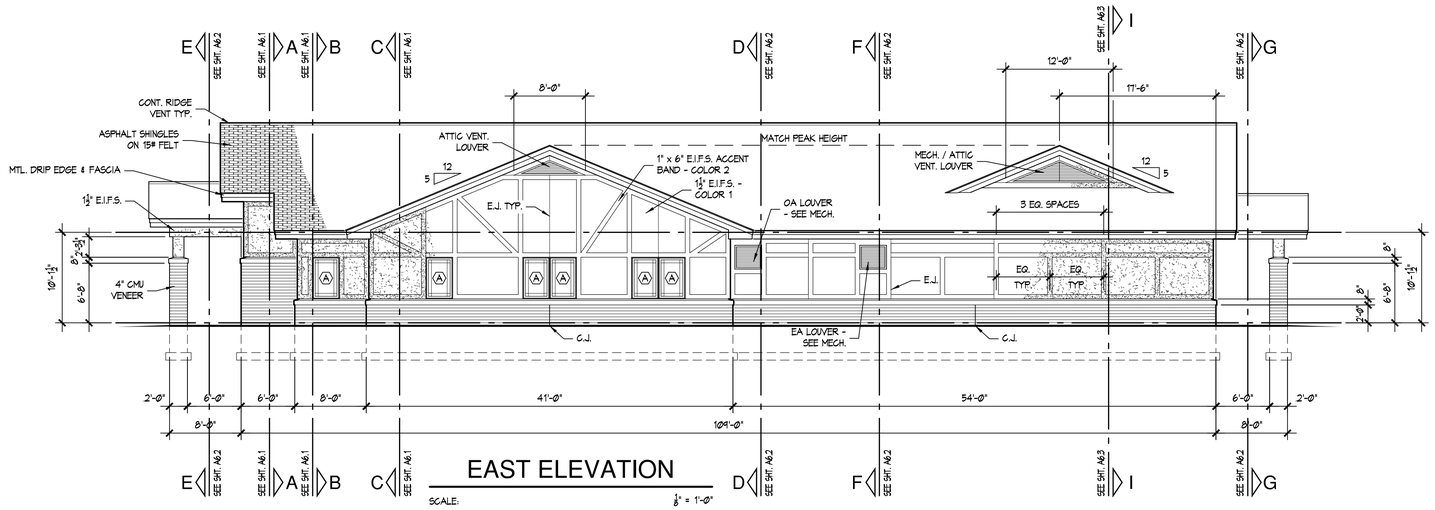
DRAWING TITLE
REFLECTED CEILING PLAN

PROJECT TITLE
PROPOSED NEW ANIMAL CONTROL FACILITY FOR:
OTSEGO COUNTY
GAYLORD, MICHIGAN

PROJECT NO. 0160-10

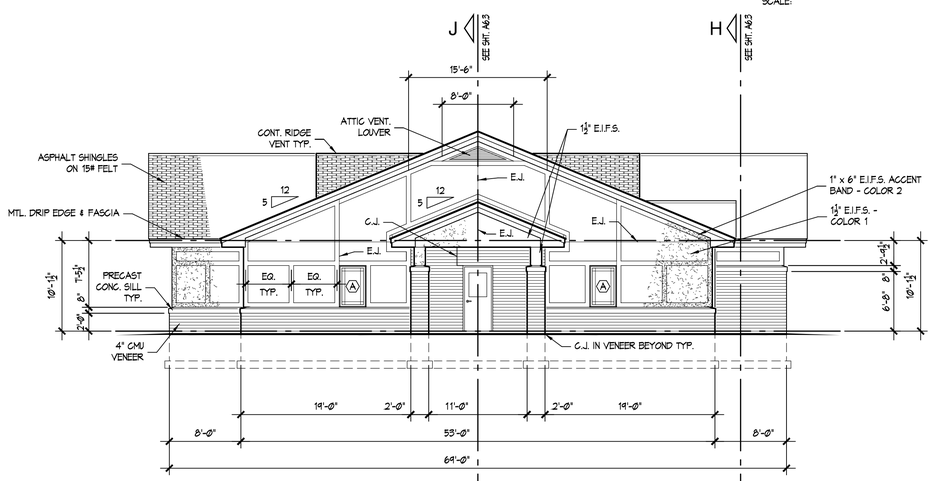
DATE APRIL 4, 2011

SHEET A3.1



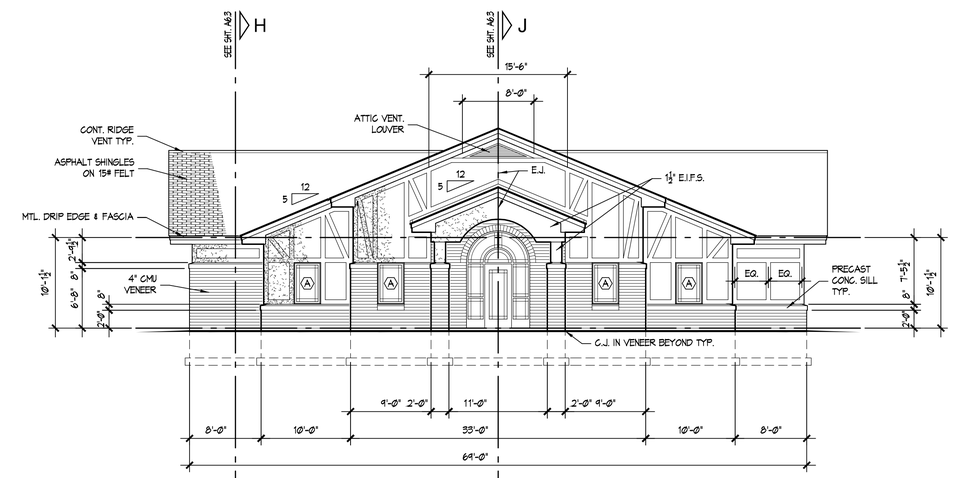
EAST ELEVATION

SCALE: 1/8" = 1'-0"



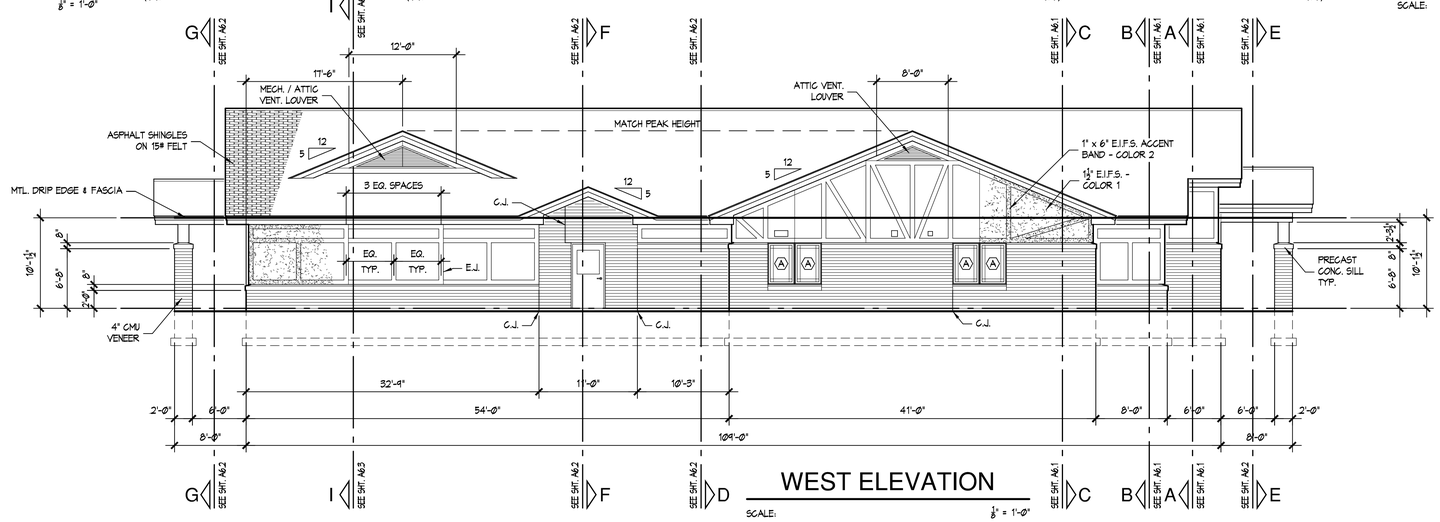
NORTH ELEVATION

SCALE: 1/8" = 1'-0"



SOUTH ELEVATION

SCALE: 1/8" = 1'-0"



WEST ELEVATION

SCALE: 1/8" = 1'-0"

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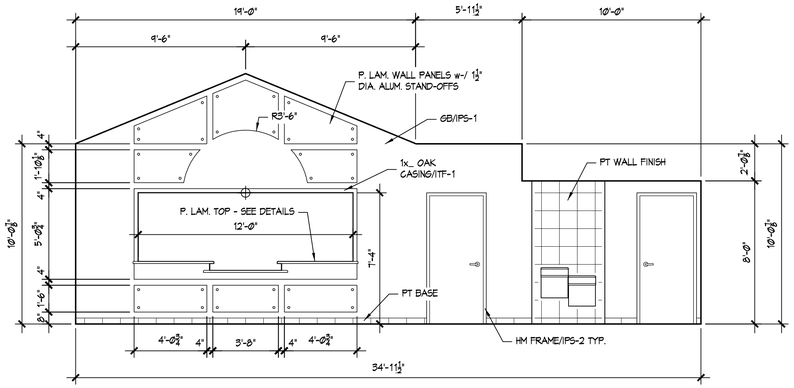
DRAWING TITLE
EXTERIOR ELEVATIONS

PROJECT TITLE
PROPOSED NEW ANIMAL CONTROL FACILITY FOR:
OTSEGO COUNTY
GAYLORD, MICHIGAN

PROJECT NO. 0160-10

DATE
DEC. 8, 2010
APRIL 4, 2011

SHEET A4.1



1 A5.1 LOBBY 102 - N

SCALE: ¼" = 1'-0"

ELEVATION ABBREVIATIONS

B.F.G.B.	BARRIER FREE GRAB BAR
CH.T.	CHALK TRAY
F.D.	FLOOR DRAIN
F.N.D.	FEMININE NAPKIN DISPOSAL
F.S.S.	FOLDING SHOWER SEAT
LAV.	LAVATORY
M.B.H.	MOP/BROOM HOLDER
M.B.	MARKER BOARD
MIR.	MIRROR
P.LAM	PLASTIC LAMINATE
P.T.D./D.	PAPER TOWEL DISPENSER/DISPOSAL
R/TH	ROBE/TOWEL HOOKS
T.B.	TACK BOARD
T.T.D.	TOILET TISSUE DISPENSER
S.D.	SOAP DISPENSER
S.C.R.	SHOWER CURTAIN ROD
W.C.	WATER CLOSET

ROOM FINISH SCHEDULE

ROOM TAG	ROOM NAME	FLOOR DATA		WALL DATA (SUBSTRATE/FINISH)				CEILING DATA		REMARKS
		MATERIAL	W. BASE	NORTH	EAST	SOUTH	WEST	MATERIAL/FINISH	HEIGHT	
101	VESTIBULE	PT	PT	GB/IPS-1	GB/IPS-1	GB/IPS-1	GB/IPS-1	GB/STF	-	
102	LOBBY	PT	PT	GB/IPS-1	GB/IPS-1	GB/IPS-1	GB/IPS-1	GB/SAF	-	NOTE 6, 7
103	KITTENS	VCT	V	FRP	FRP	FRP	FRP	SAT-1	8'-0"	
104	ADOPTION/ CONF.	PT	PT	GB/IPS-1	GB/IPS-1	GB/IPS-1	GB/IPS-1	SAT-1	8'-0"	
105	STORAGE	VCT	V	GB/IPS-1	GB/IPS-1	GB/IPS-1	GB/IPS-1	SAT-1	8'-0"	
106	TOILET	PT	PT	PT	PT	PT	PT	SAT-1	8'-0"	
107	PASSAGE	VCT	V	GB/IPS-1	GB/IPS-1	GB/IPS-1	GB/IPS-1	SAT-1	8'-0"	
108	FELINE	VCT	V	FRP	FRP	FRP	FRP	SAT-1	8'-0"	
109	CAGED FELINE	VCT	V	FRP	FRP	FRP	FRP	SAT-1	8'-0"	
110	FELINE ISOLATION	VCT	V	FRP	FRP	FRP	FRP	SAT-1	8'-0"	
111	RECEPTION	PT	PT	GB/IPS-1	GB/IPS-1	GB/IPS-1	GB/IPS-1	SAT-1	8'-0"	
112	RECORDS	VCT	V	GB/IPS-1	GB/IPS-1	GB/IPS-1	GB/IPS-1	SAT-1	8'-0"	
113	PASSAGE	VCT	V	GB/IPS-1	GB/IPS-1	GB/IPS-1	GB/IPS-1	SAT-1	8'-0"	
114	FELINE QUARANTINE	VCT	V	FRP	FRP	FRP	FRP	SAT-1	8'-0"	
115	DIRECTOR'S OFFICE	VCT	V	GB/IPS-1	GB/IPS-1	GB/IPS-1	GB/IPS-1	SAT-1	8'-0"	
116	A.C.O. OFFICE	VCT	V	GB/IPS-1	GB/IPS-1	GB/IPS-1	GB/IPS-1	SAT-1	8'-0"	
117	STAFF CONFERENCE	VCT	V	GB/IPS-1	GB/IPS-1	GB/IPS-1	GB/IPS-1	SAT-1	8'-0"	
118	TELECOMMUNICATIONS	CONC.	V	GB/IPS-1	GB/IPS-1	GB/IPS-1	GB/IPS-1	GB KD/IPS-1	10'-0⅞"	NOTE 1
119	STORAGE	VCT	V	GB/IPS-1	GB/IPS-1	GB/IPS-1	GB/IPS-1	SAT-1	8'-0"	
120	STAFF TOILET	PT	PT	PT	PT	PT	PT	SAT-1	8'-0"	NOTE 2, 5
121	EXAM/ CAT GROOM	VCT	V	FRP	FRP	FRP	FRP	SAT-1	8'-0"	
122A	PASSAGE	FAF	FAF	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	GB KD/IPS-1	10'-0⅞"	
122B	PASSAGE	FAF	FAF	-	CMU/IPS-2	-	CMU/IPS-2	GB KD/IPS-1	10'-0⅞"	
122C	PASSAGE	FAF	FAF	-	CMU/IPS-2	-	CMU/IPS-2	GB KD/IPS-1	10'-0⅞"	
122D	PASSAGE	FAF	FAF	CMU/IPS-2	-	CMU/IPS-2	CMU/IPS-2	GB KD/IPS-1	10'-0⅞"	
123	PUPPIES	FAF	V	FRP	FRP	FRP	FRP	SAT-1	8'-0"	
124	MECHANICAL	CONC.		CMU/IPS-1	CMU/IPS-1	CMU/IPS-1	CMU/IPS-1	GB KD/IPS-1	10'-0⅞"	NOTE 1
125	KENNELS	FAF	FAF	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	GB KD/IPS-1	VARIES	NOTE 4
126	DOG WASH	FAF	FAF	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	GB KD/IPS-1	10'-0⅞"	
127	JANITOR'S CLOSET	FAF	FAF	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	GB KD/IPS-1	10'-0⅞"	
128	MECHANICAL	CONC.	-	CMU/IPS-1	CMU/IPS-1	CMU/IPS-1	CMU/IPS-1	GB KD/IPS-1	10'-0⅞"	NOTE 1
129	LAUNDRY	FAF	FAF	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	GB KD/IPS-1	10'-0⅞"	
130	STORAGE	FAF	FAF	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	GB KD/IPS-1	10'-0⅞"	
131	KENNELS	FAF	FAF	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	GB KD/IPS-1	VARIES	NOTE 4
132	DRAINWAY	FAF	FAF	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	GB KD-IPS-1	VARIES	
133	PASSAGE	FAF	FAF	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	GB KD/IPS-1	VARIES	
134	DRAINWAY	FAF	FAF	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	EMD/IPS-2	6'-8"	
135	ISOLATION	FAF	FAF	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	GB KD/IPS-1	VARIES	
136	DRAINWAY	FAF	FAF	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	CMU/IPS-2	GB KD/IPS-1	VARIES	
137	STAIR	CONC.	-	-	CMU-GB/IPS-2	CMU-GB/IPS-2	CMU-GB/IPS-2	GB KD/IPS-1	VARIES	NOTE 1
138	STORAGE MEZZANINE	CONC.	-	CMU/IPS-2	-	CMU-GB/IPS-2	-	GB KD/IPS-1	VARIES	NOTE 1, 3
139	MECHANICAL	CONC.	-	CMU/IPS-1	CMU/IPS-1	CMU/IPS-1	CMU/IPS-1	GB KD/IPS-1	10'-0⅞"	NOTE 1

GENERAL NOTES:

PAINT ALL INTERIOR HOLLOW METAL DOORS IPS-3.

PAINT ALL INTERIOR HOLLOW METAL DOOR FRAMES IPS-3.

PAINT METAL ALL EXPOSED SURFACES OF METAL STAIR (EXCLUDING CONCRETE TREADS) IPS-3.

PAINT INTERIOR EXPOSED TO VIEW MISCELLANEOUS METAL ITEMS IPS-3.

PAINT EXTERIOR EXPOSED TO VIEW MISCELLANSOUS METAL ITEMS EPS-1.

RUNNING WOOD TRIM IS TO BE PAINTED TO MATCH ADJACENT WALL SURFACE.

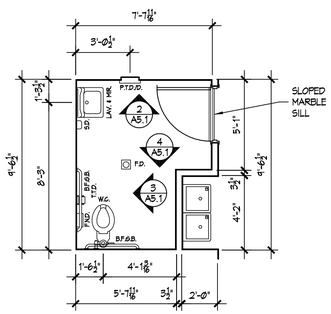
PAINT EXPOSED TO VIEW EXTERIOR MECHANICAL, ELECTRICAL, PLUMBING ITEMS NOT FACTORY FINISHED EPS-1.

KEYED NOTES:

1. SEAL EXPOSED CONCRETE FLOOR AS SPECIFIED.
2. SHOWER FLOOR AND WALLS ARE TO BE CERAMIC TILE.
3. PAINT MEZZANINE RAILINGS IPS-3.
4. PAINT EMD CEILING IN KENNELS IPS-3.
5. SHOWER CEILING GB/IPS-3.
6. DRINKING FOUNTAIN ALCOVE WALLS TO BE FINISHED CERAMIC TILE.
7. SEE INTERIOR ELEVATIONS FOR WALL PANEL LAYOUT.

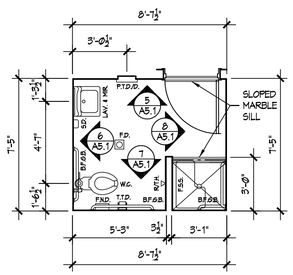
ROOM FINISH SCHEDULE ABBREVIATIONS:

CMU	CONCRETE MASONRY UNITS
CONC.	CONC. (SEALED)
CT	CERAMIC TILE
EMD	EXPOSED METAL DECK
ETR	EXISTING TO REMAIN
FAF	FLUID APPLIED FLOORING
FRP	FIBERGLASS REINFORCED PLASTIC
GB	GYPSUM BOARD
IPS-1	INTERIOR PAINT SYSTEM -1 (LATEX)
IPS-2	INTERIOR PAINT SYSTEM -2 (EPOXY)
IPS-3	INTERIOR PAINT SYSTEM -2 (ENAMEL)
KD	KNOCK-DOWN PLASTER FINISH
PT	PORCELAIN TILE
SAT-1	SUSPENDED ACOUSTICAL TILE - 1 (2'x4')
STF	SPRAYED-ON TEXTURE FINISH
V	VINYL WALL BASE
VCT	VINYL COMPOSITION TILE



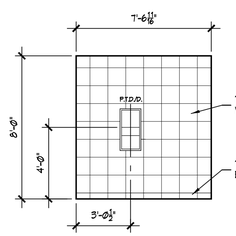
TOILET 106

SCALE: ¼" = 1'-0"



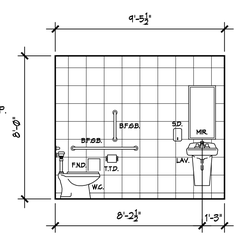
TOILET 120

SCALE: ¼" = 1'-0"



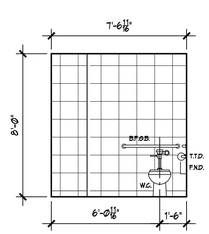
2 A5.1 TOILET 106 - E

SCALE: ¼" = 1'-0"



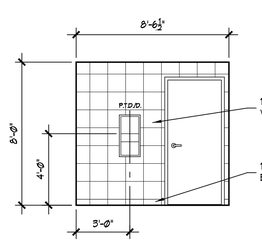
3 A5.1 TOILET 106 - N

SCALE: ¼" = 1'-0"



4 A5.1 TOILET 106 - W

SCALE: ¼" = 1'-0"



5 A5.1 TOILET 120 - E

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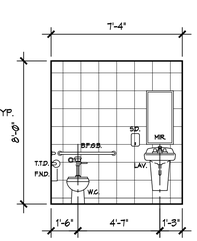

6 A5.1 TOILET 120 - N

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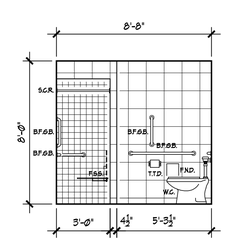
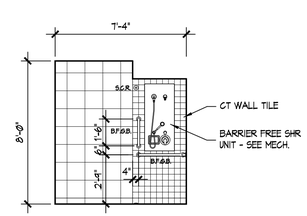


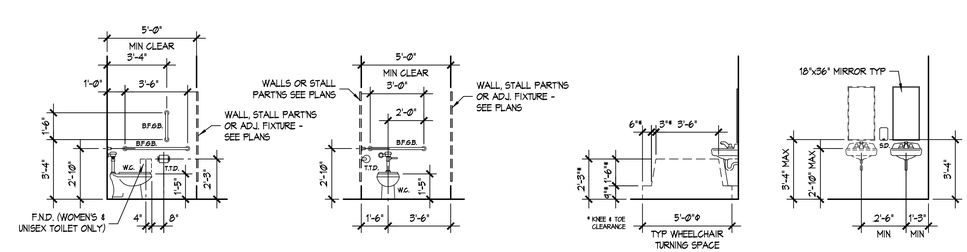
7 A5.1 TOILET 120 - W

SCALE: ¼" = 1'-0"



8 A5.1 TOILET 120 - S

SCALE: ¼" = 1'-0"



BARRIER FREE TOILET

BARRIER FREE LAVATORY

TYPICAL TOILET FIXTURE AND ACCESSORIE ELEVATIONS

SCALE: ¼" = 1'-0"

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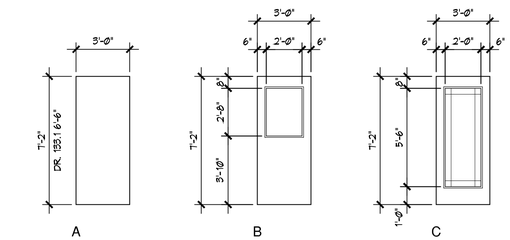
DRAWING TITLE: ROOM FINISH SCHEDULE 1/4" PLANS and INT. ELEVATIONS

PROJECT TITLE: PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY, GAYLORD, MICHIGAN

PROJECT NO. 0160-10

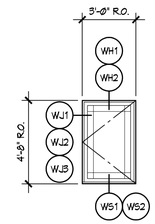
DATE APRIL 4, 2011

SHEET A5.1



DOOR ELEVATIONS

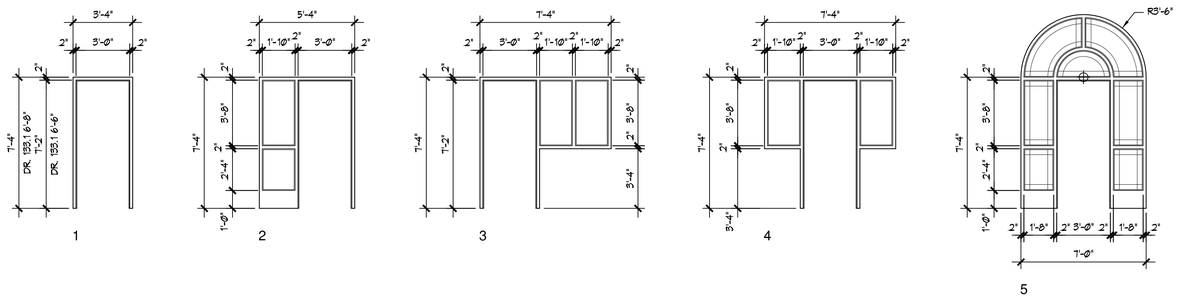
SCALE: $\frac{1}{4}$" = 1'-0"

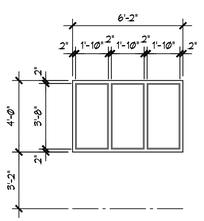


Ⓐ CASEMENT

WINDOW ELEVATIONS

SCALE: $\frac{1}{4}$" = 1'-0"





FRAME ELEVATIONS

SCALE: $\frac{1}{4}$" = 1'-0"

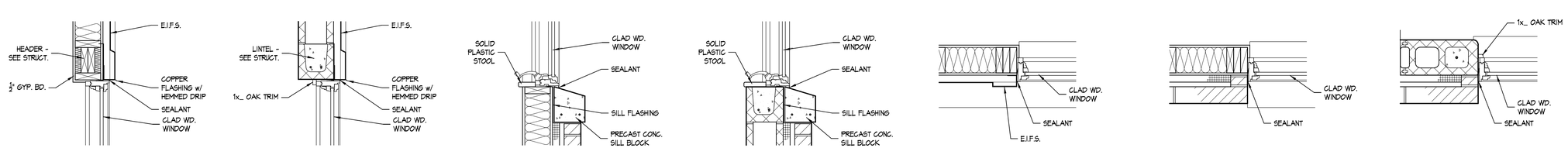
DOOR & FRAME SCHEDULE

DOOR TAG	DOOR SIZE	DOOR DATA			FRAME DATA			DETAILS			HDWE SET NO.	REMARKS
		MATERIAL	ELEV.	GLAZING	MATERIAL	ELEV.	GLAZING	HEAD	JAMB	SILL		
101.1	3'-0"x7'-2"	FRP	C	INSUL	AL	5	INSUL	H1	J1	S1/52	1	
102.1	3'-0"x7'-2"	WD	C	TEMP	HM	5	TEMP	H2	J2	S3/54	2	
103.1	3'-0"x7'-2"	WD	B	TEMP	HM	1	-	H2 (SIM)	J2 (SIM)	S5	3	
103.2	-	-	-	-	HM	?	TEMP	H2 (SIM)	J2 (SIM)	S6	-	BORROWED LIGHT UNIT
104.1	3'-0"x7'-2"	WD	B	TEMP	HM	2	TEMP	H2 (SIM)	J2 (SIM)	S3	3A	
105.1	3'-0"x7'-2"	WD	A	-	HM	1	-	H2 (SIM)	J2 (SIM)	S5	3A	
106.1	3'-0"x7'-2"	WD	A	-	HM	1	-	H2 (SIM)	J2 (SIM)	S7	5	
107.1	3'-0"x7'-2"	WD	A	-	HM	1	-	H2 (SIM)	J2 (SIM)	S5	6	
108.1	3'-0"x7'-2"	WD	B	INSUL	HM	3	INSUL	H3	J3	S8/59	4	ACOUST. SEALS
109.1	3'-0"x7'-2"	WD	B	INSUL	HM	4	INSUL	H3	J3	S8/59	7	ACOUST. SEALS
110.1	3'-0"x7'-2"	WD	B	INSUL	HM	1	-	H4	J4	S8 (SIM)	4	ACOUST. SEALS
112.1	3'-0"x7'-2"	WD	A	-	HM	1	-	H2 (SIM)	J2 (SIM)	S5	8	
113.1	3'-0"x7'-2"	WD	A	-	HM	1	-	H2 (SIM)	J2 (SIM)	S10	6A	
114.1	3'-0"x7'-2"	WD	B	INSUL	HM	1	-	H4	J4	S8 (SIM)	9	ACOUST. SEALS
115.1	3'-0"x7'-2"	WD	B	TEMP	HM	1	-	H2 (SIM)	J2 (SIM)	S8 (SIM)/56	8A	
115.2	-	-	-	-	HM	?	TEMP	H2 (SIM)	J2 (SIM)	S6	-	BORROWED LIGHT UNIT
116.1	3'-0"x7'-2"	WD	B	TEMP	HM	1	-	H5	J5	S8 (SIM)	8A	
117.1	3'-0"x7'-2"	WD	A	-	HM	1	-	H5	J5	S8 (SIM)	3A	
118.1	3'-0"x7'-2"	WD	A	-	HM	1	-	H2 (SIM)	J2 (SIM)	S11	3A	
119.1	3'-0"x7'-2"	WD	A	-	HM	1	-	H2 (SIM)	J2 (SIM)	S8 (SIM)	3A	
120.1	3'-0"x7'-2"	WD	A	-	HM	1	-	H5	J5	S12	5	
121.1	3'-0"x7'-2"	WD	A	-	HM	1	-	H5	J5	S8 (SIM)	3	
122.1	3'-0"x7'-2"	ACOUST. HM	A	-	HM	1	-	H6	J6	S13	9A	ACOUST. SEALS
122.2	3'-0"x7'-2"	ACOUST. HM	A	-	HM	1	-	H6	J6	S13	9A	ACOUST. SEALS
122.3	3'-6"x7'-2"	FRP	B (SIM)	INSUL	AL	1 (SIM)	-	H7	J7	S14	1A	
123.1	3'-0"x7'-2"	HM	B	TEMP	HM	1	-	H6	J6	S16 (SIM)	9A	
123.2	-	-	-	-	HM	?	INSUL	H4 (SIM)	J4 (SIM)	S9	-	BORROWED LIGHT UNIT
124.1	3'-6"x7'-2"	HM	A (SIM)	-	HM	1 (SIM)	-	H8	J8	S15	3A	
125.1	3'-0"x7'-2"	HM	B	TEMP	HM	1	-	H8	J8	S16	3	
127.1	3'-0"x7'-2"	HM	A	-	HM	1	-	H8	J8	S16	3A	
128.1	3'-0"x7'-2"	HM	A	-	HM	1	-	H8	J8	S15	3A	
129.1	3'-0"x7'-2"	HM	A	-	HM	1	-	H8	J8	S16	3A	
130.1	3'-0"x7'-2"	HM	A	-	HM	1	-	H8	J8	S16	3A	
131.1	3'-0"x7'-2"	HM	B	TEMP	HM	1	-	H8	J8	S16	3B	
133.1	3'-0"x7'-2"	FRP	B	INSUL	AL	1	-	H7	J7	S14	1A	
134.1	3'-0"x6'-6"	HM	A	-	HM	1	-	H8	J8	S17	3A	
135.1	3'-0"x7'-2"	HM	A	-	HM	1	-	H8	J8	S16	3B	
139.1	3'-0"x7'-2"	HM	A	-	HM	1	-	H8	J8	-	3A	

GENERAL NOTES:

PAINT ALL INTERIOR HOLLOW METAL DOORS IPS-3.

PAINT ALL INTERIOR HOLLOW METAL DOOR FRAMES IPS-3.



WH1 WH1 WS1 WS2 WJ1 WJ2 WJ3

WINDOW HEAD, JAM & SILL DETAILS

SCALE: 1" = 1'-0"

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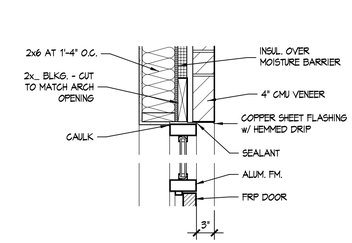
DRAWING TITLE: DOOR SCHEDULE DOOR/FRAME ELEV. and DETAILS

PROJECT TITLE: PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY GAYLORD, MICHIGAN

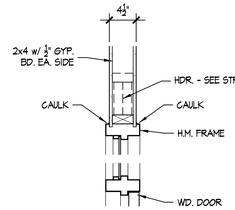
PROJECT NO. 0160-10

DATE APRIL 4, 2011

SHEET A5.2



H1



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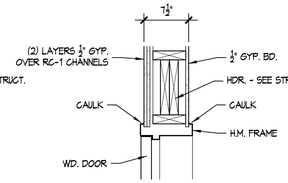

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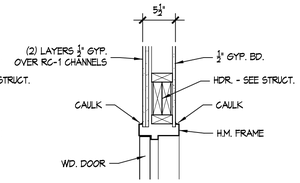

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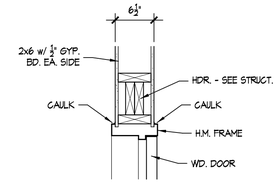

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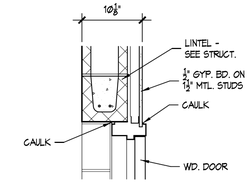

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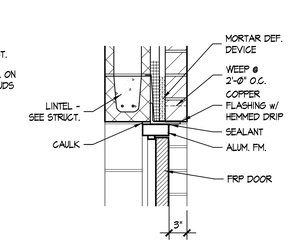

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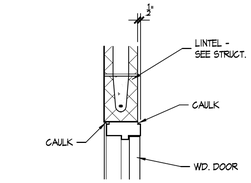
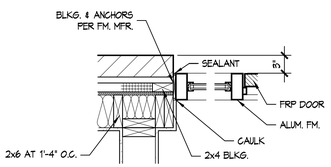


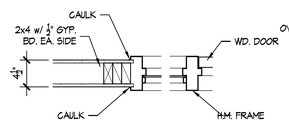
H8

HEAD DETAILS

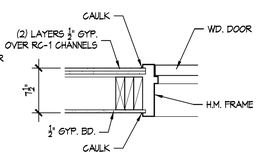
SCALE: 1" = 1'-0"



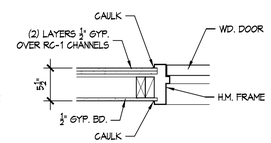
J1



J2



J3



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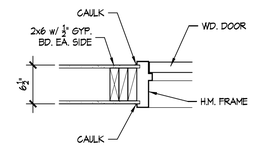

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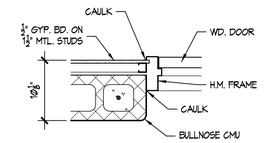

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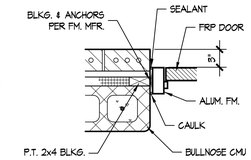
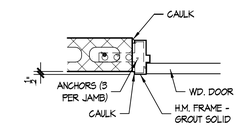


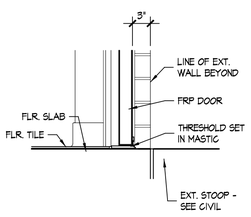
J7



J8

JAMB DETAILS

SCALE: 1" = 1'-0"



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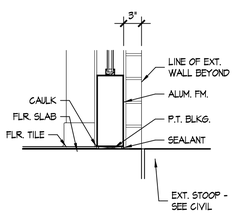

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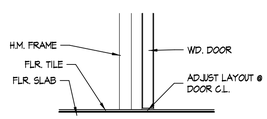

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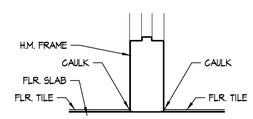

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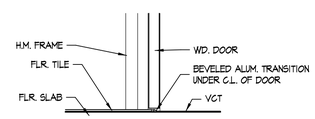

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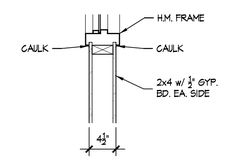
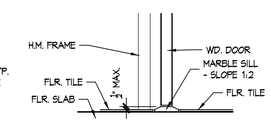
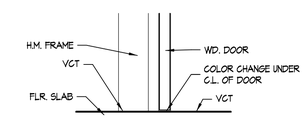


S6



S7



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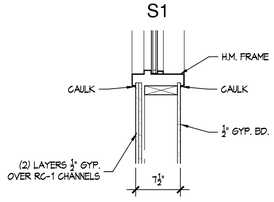

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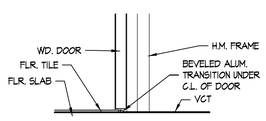

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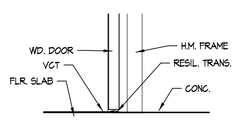

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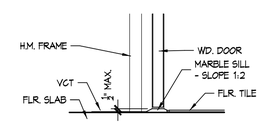

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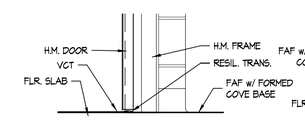

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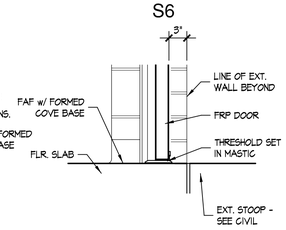

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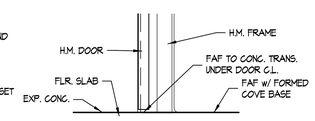
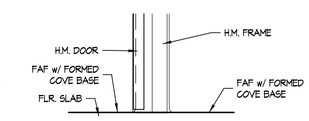


S15



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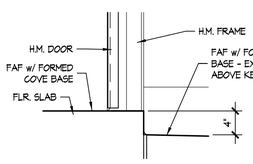

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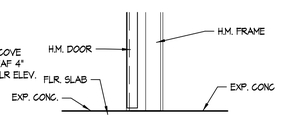

S18

SILL DETAILS

SCALE: 1" = 1'-0"

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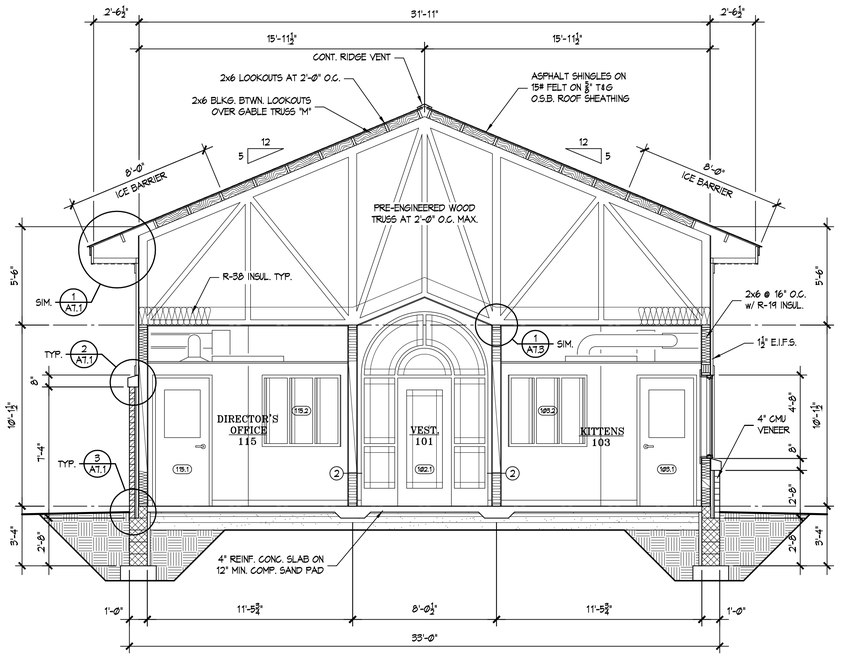
DRAWING TITLE
HEAD, JAMB & SILL DETAILS

PROJECT TITLE
PROPOSED NEW ANIMAL CONTROL FACILITY FOR:
OTSEGO COUNTY
GAYLORD, MICHIGAN

PROJECT NO.
0160-10

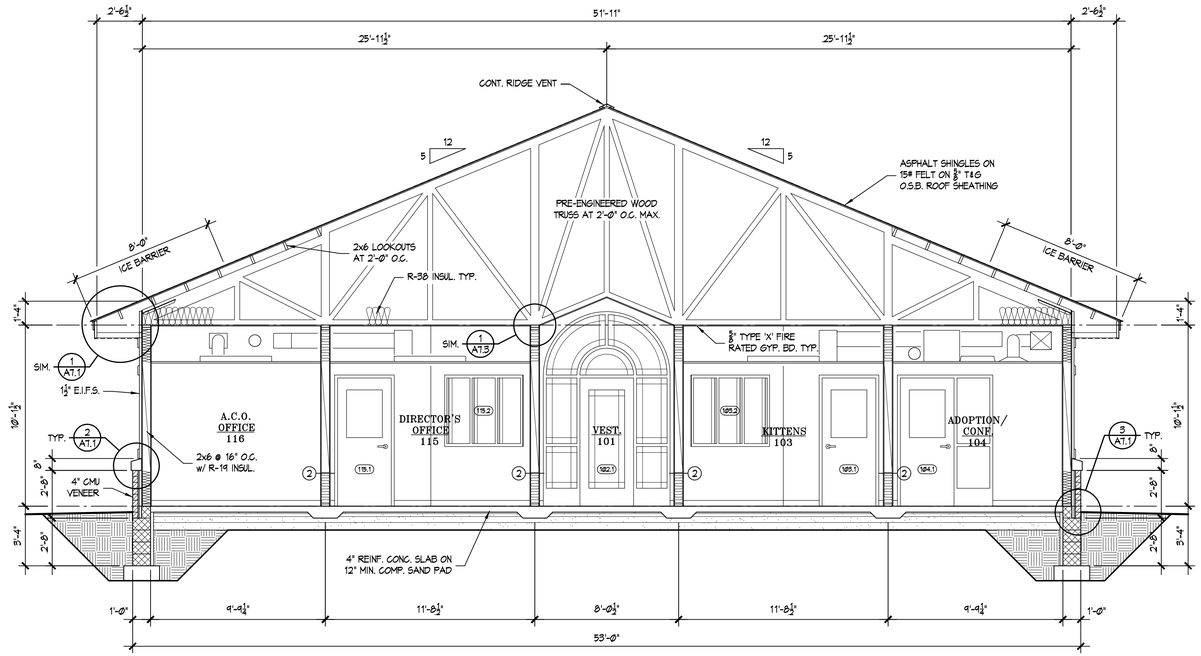
DATE
APRIL 4, 2011

SHEET
A5.3



SECTION "A-A"

SCALE: ¼" = 1'-0"



SECTION "B-B"

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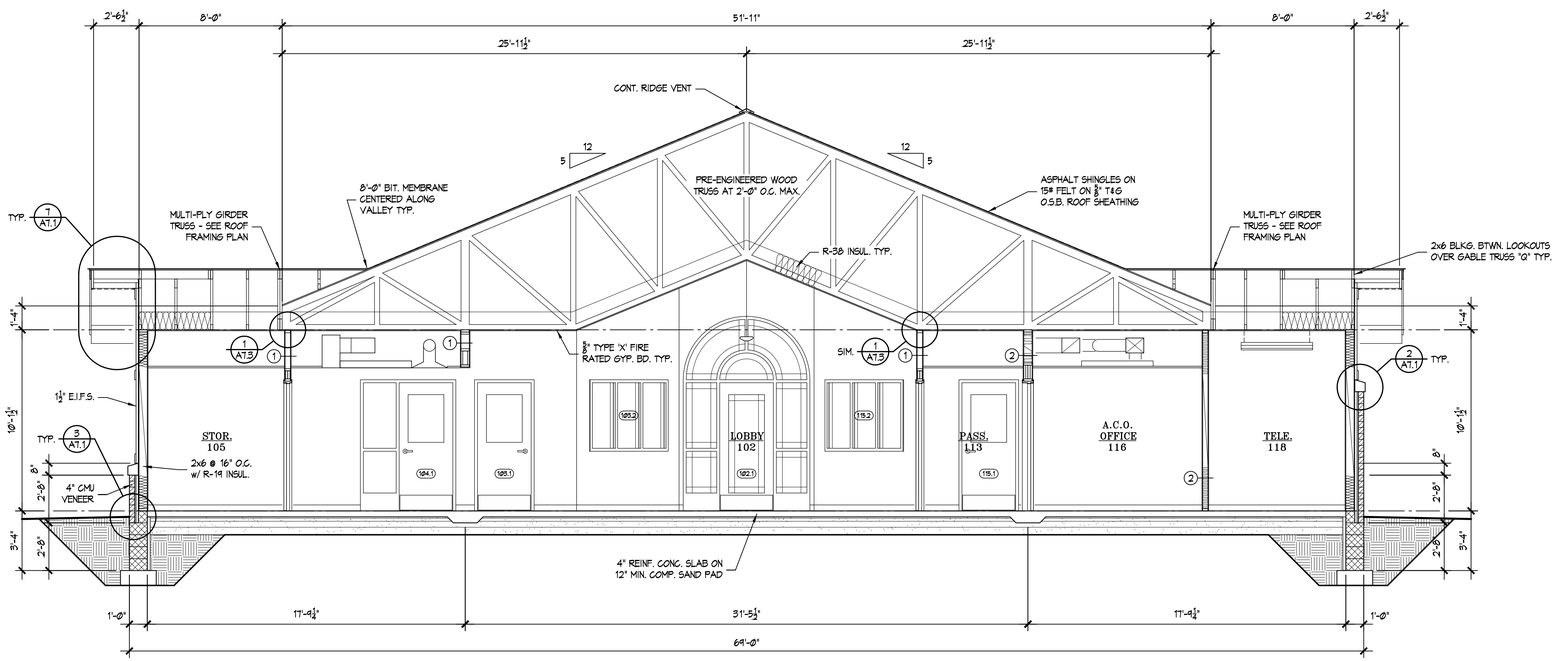
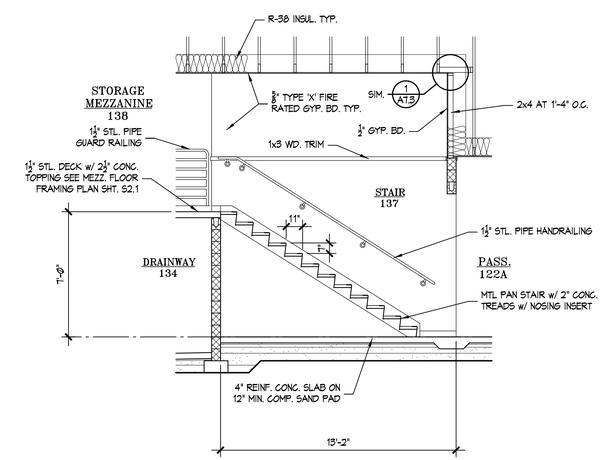


SECTION "C-C"

SCALE: ¼" = 1'-0"



STAIR SECTION

SCALE: ¼" = 1'-0"

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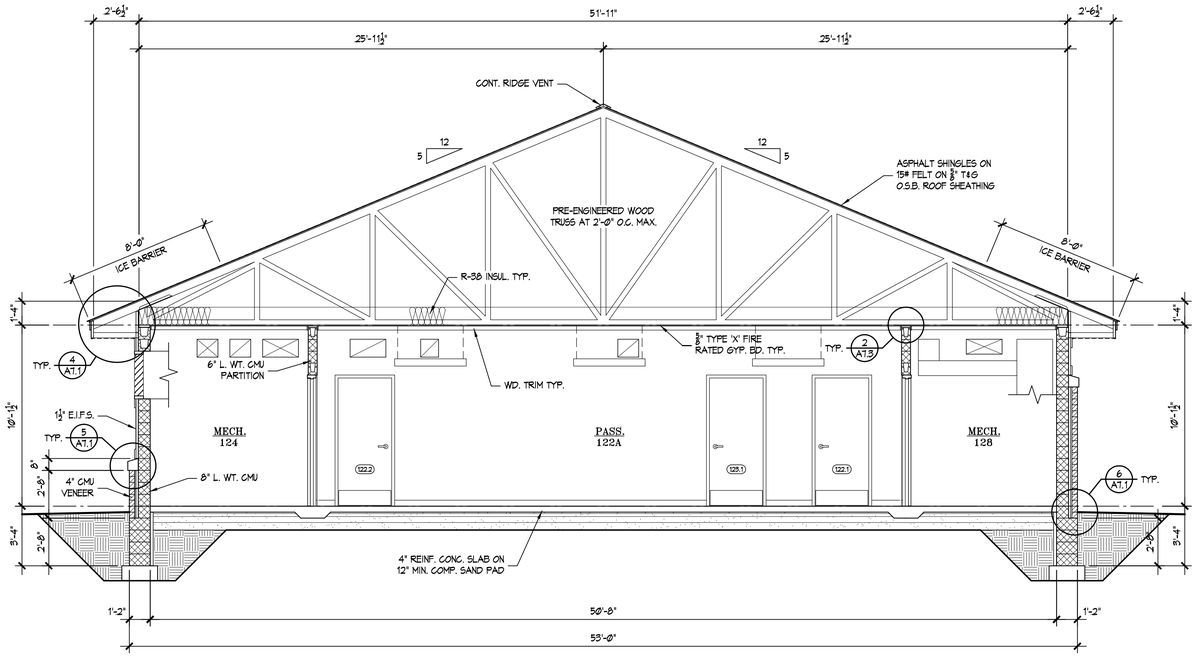
DRAWING TITLE
BUILDING SECTIONS

PROJECT TITLE
PROPOSED NEW ANIMAL CONTROL FACILITY FOR:
OTSEGO COUNTY
GAYLORD, MICHIGAN

PROJECT NO. 0160-10

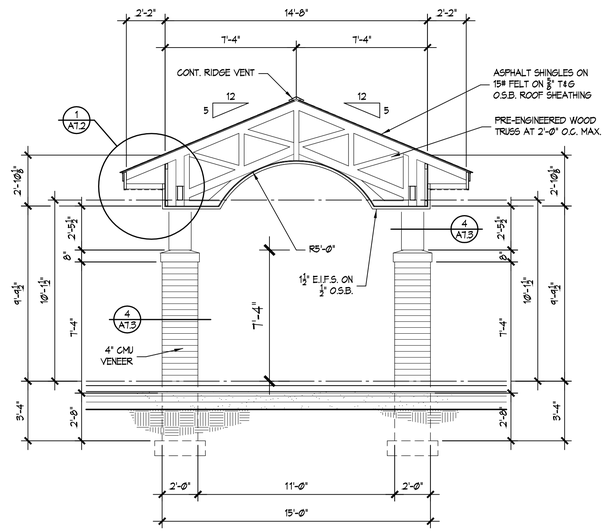
DATE
DEC. 8, 2010
APRIL 4, 2011

SHEET A6.1



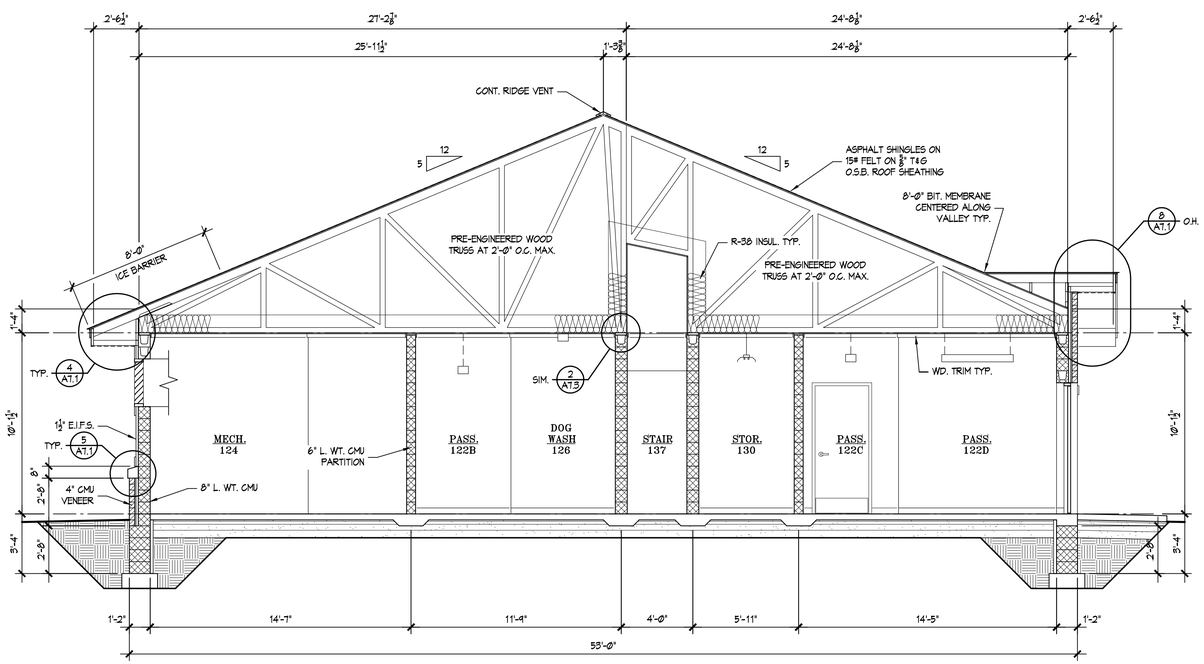
SECTION "D-D"

SCALE: ¼" = 1'-0"



SECTION "E-E"

SCALE: ¼" = 1'-0"



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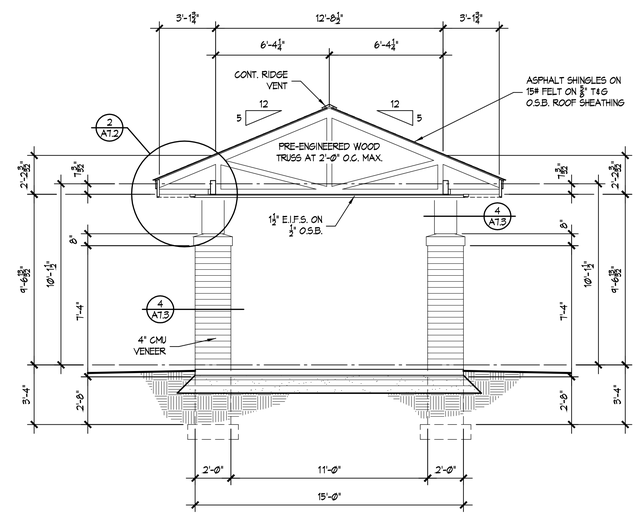
SCALE: ¼" = 1'-0"



SECTION "G-G"

SCALE: ¼" = 1'-0"

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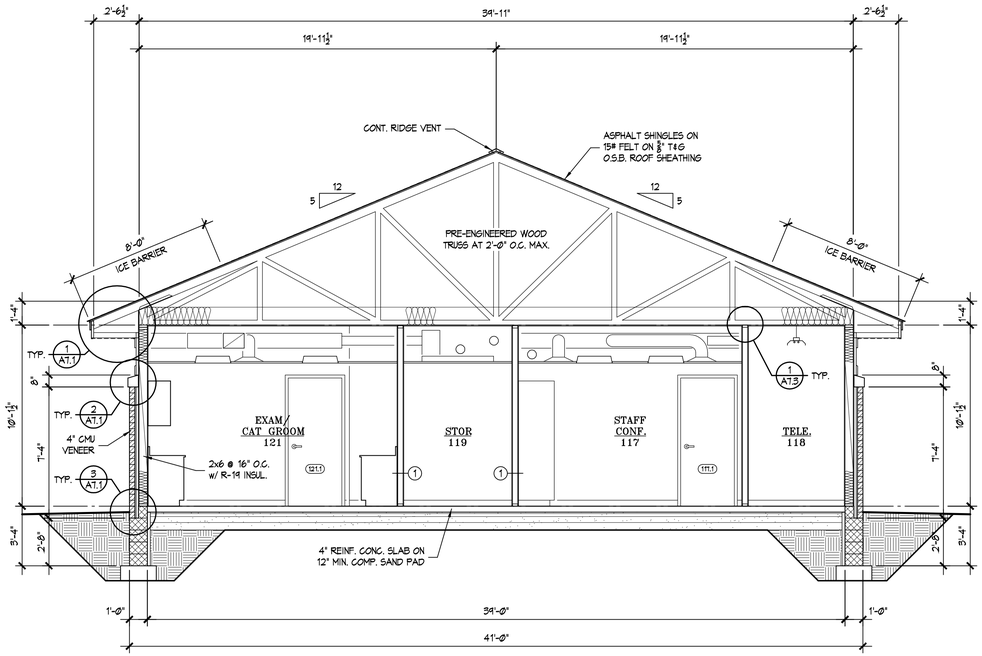
DRAWING TITLE
BUILDING SECTIONS

PROJECT TITLE
PROPOSED NEW ANIMAL CONTROL FACILITY FOR:
OTSEGO COUNTY
GAYLORD, MICHIGAN

PROJECT NO. 0160-10

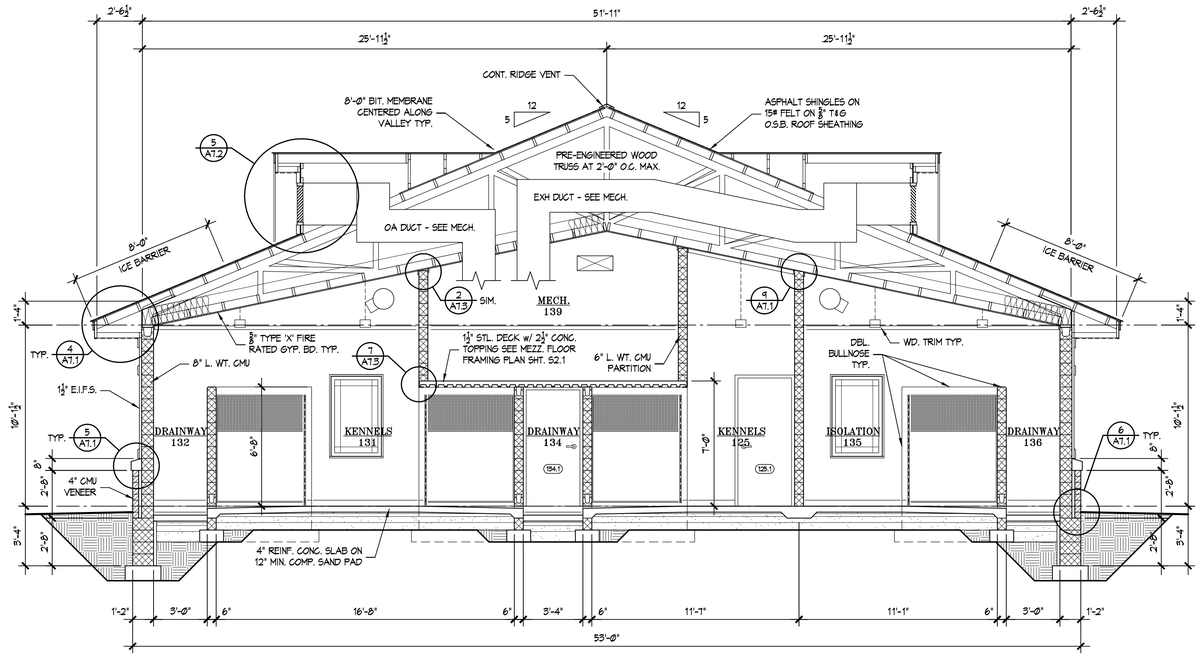
DATE
DEC. 8, 2010
APRIL 4, 2011

SHEET A6.2



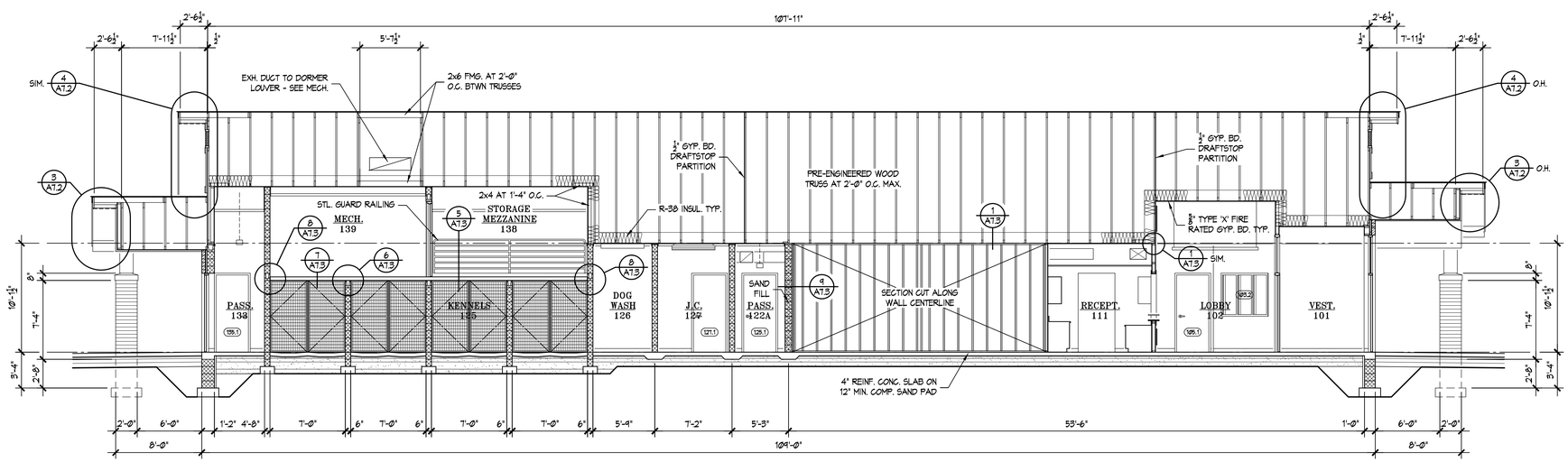
SECTION "H-H"

SCALE: 1/4" = 1'-0"



SECTION "I-I"

SCALE: 1/4" = 1'-0"



SECTION "J-J"

SCALE: 3/8" = 1'-0"

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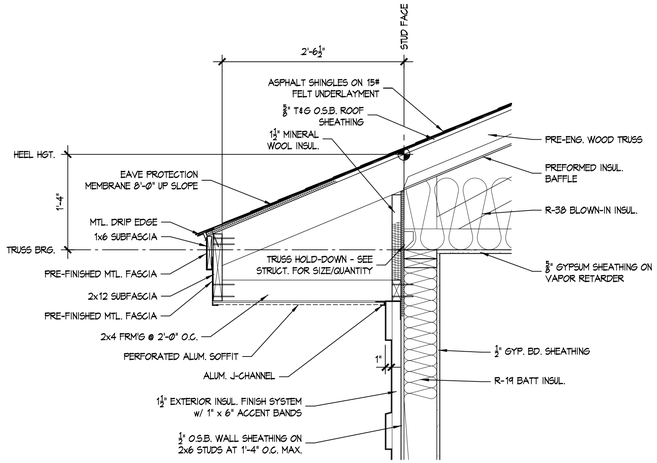
DRAWING TITLE
BUILDING SECTIONS

PROJECT TITLE
PROPOSED NEW ANIMAL CONTROL FACILITY FOR:
OTSEGO COUNTY
GAYLORD, MICHIGAN

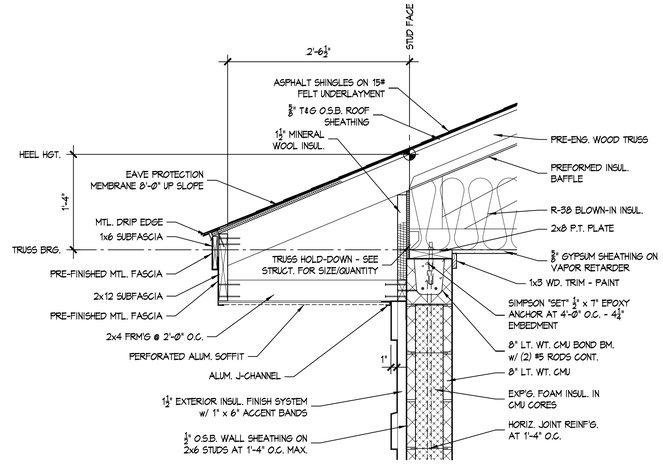
PROJECT NO. 0160-10

DATE
DEC. 8, 2010
APRIL 4, 2011

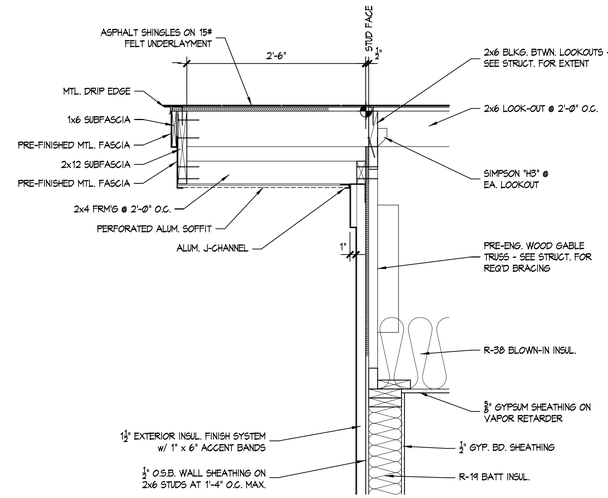
SHEET A6.3



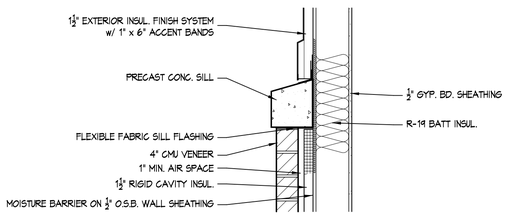
1 AT.1 TYP. EAVE DETAIL
SCALE: 1" = 1'-0"



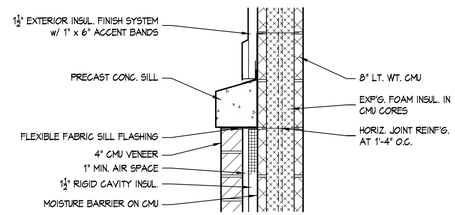
4 AT.1 TYP. EAVE DETAIL
SCALE: 1" = 1'-0"



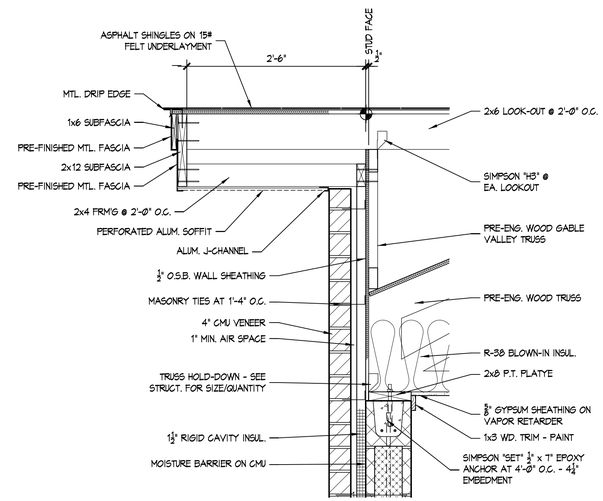
7 AT.1 TYP. GABLE DETAIL
SCALE: 1" = 1'-0"



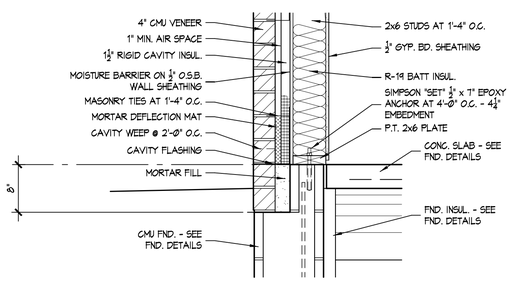
2 AT.1 TYP. SILL DETAIL
SCALE: 1" = 1'-0"



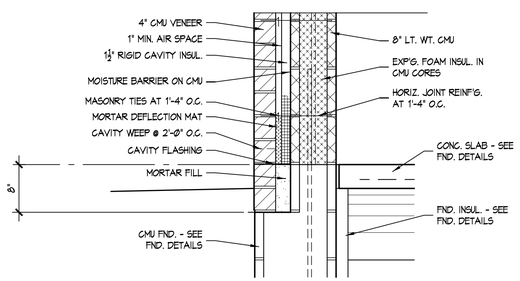
5 AT.1 TYP. SILL DETAIL
SCALE: 1" = 1'-0"



9 AT.1 TYP. GABLE DETAIL
SCALE: 1" = 1'-0"



3 AT.1 TYP. WALL DETAIL
SCALE: 1" = 1'-0"



6 AT.1 TYP. WALL DETAIL
SCALE: 1" = 1'-0"

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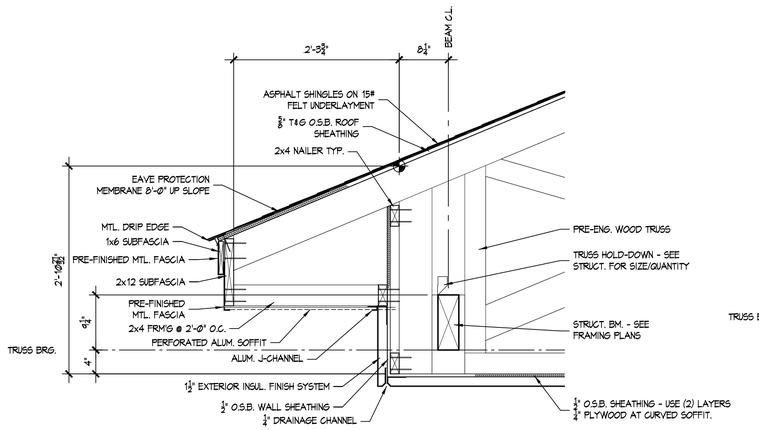
DRAWING TITLE
BUILDING DETAILS

PROJECT TITLE
PROPOSED NEW ANIMAL CONTROL FACILITY FOR:
OTSEGO COUNTY
GAYLORD, MICHIGAN

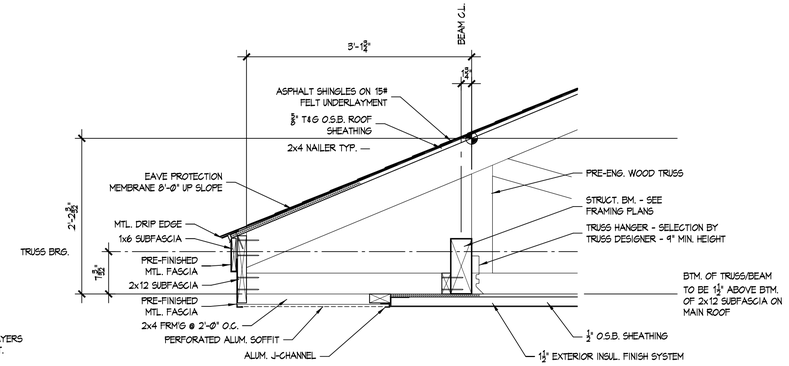
PROJECT NO. 0160-10

DATE APRIL 4, 2011

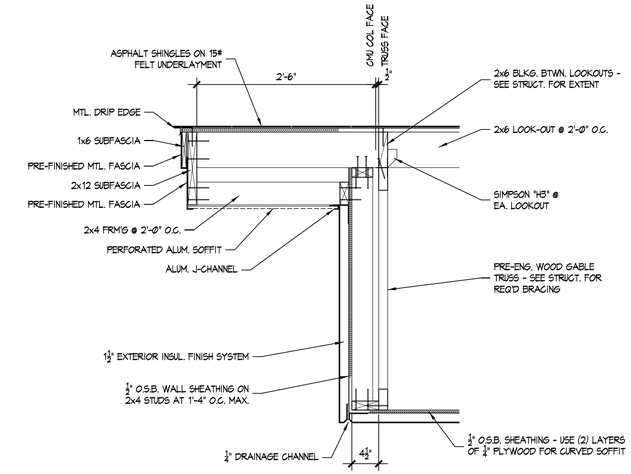
SHEET A7.1



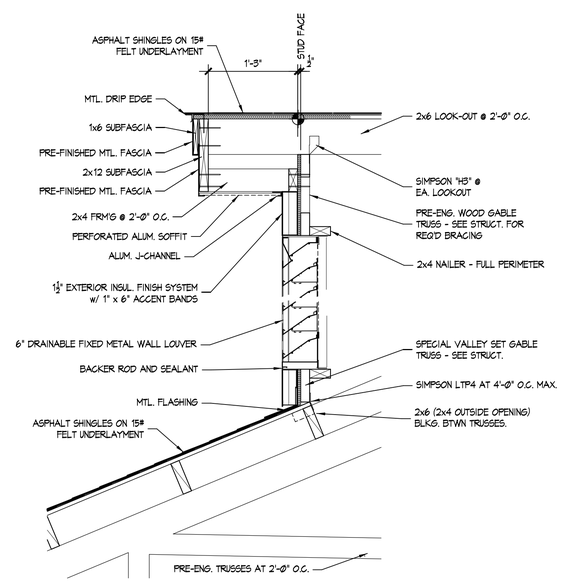
1 / A7.2 CANOPY EAVE DETAIL
SCALE: 1" = 1'-0"



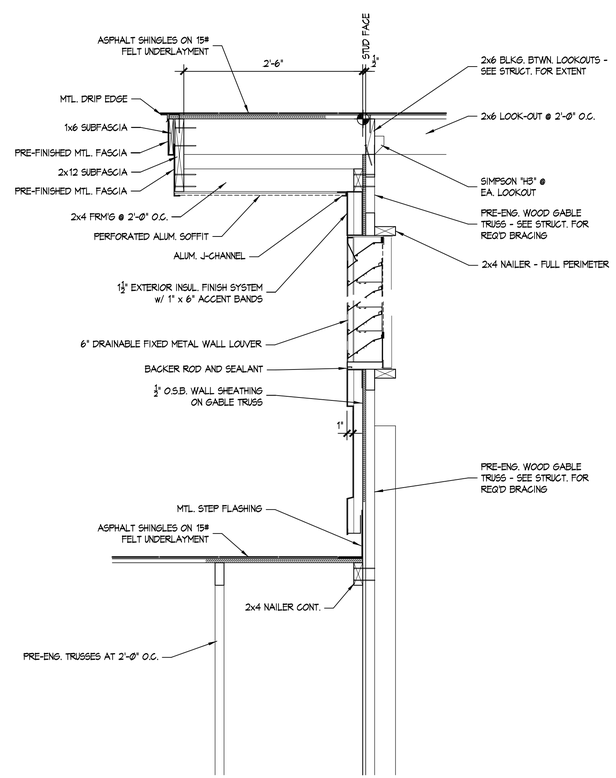
2 / A7.2 CANOPY EAVE DETAIL
SCALE: 1" = 1'-0"



3 / A7.2 TYP. GABLE DETAIL
SCALE: 1" = 1'-0"



5 / A7.2 VALLEY SET DETAIL
SCALE: 1" = 1'-0"



4 / A7.2 TYP. GABLE DETAIL
SCALE: 1" = 1'-0"

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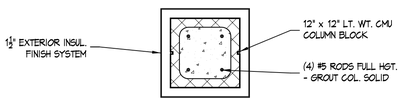
DRAWING TITLE
BUILDING DETAILS

PROJECT TITLE
PROPOSED NEW ANIMAL CONTROL FACILITY FOR:
OTSEGO COUNTY
GAYLORD, MICHIGAN

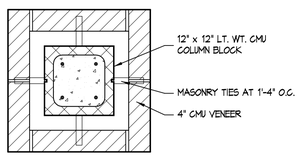
PROJECT NO. 0160-10

DATE APRIL 4, 2011

SHEET A7.2



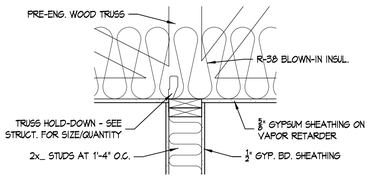
DETAIL AT E.I.F.S.



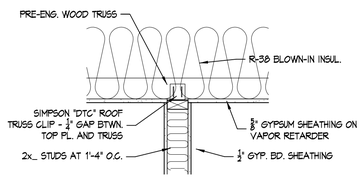
DETAIL AT CMU VENEER

4 / A7.3 TYP. COL. DETAIL

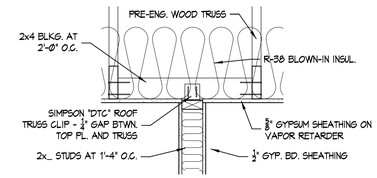
SCALE: 1" = 1'-0"



LOAD BRG.



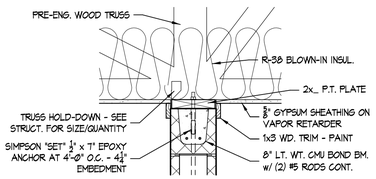
NON-BRG. PERPENDICULAR TO TRUSS



NON-BRG. PARALLEL TO TRUSS

1 / A7.3 TYP. WOOD PARTITION DETAILS

SCALE: 1" = 1'-0"



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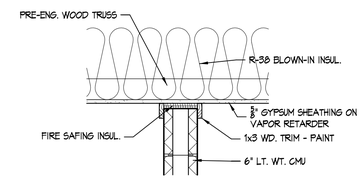

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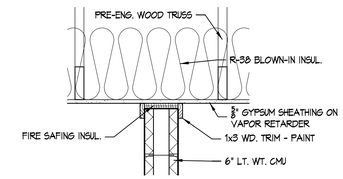
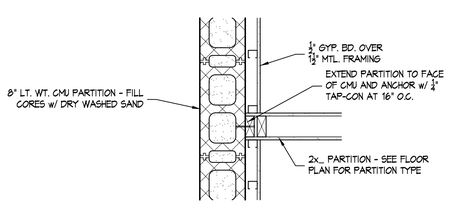


NON-BRG. PARALLEL TO TRUSS

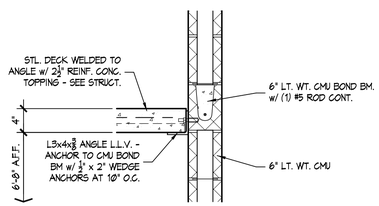
2 / A7.3 TYP. MASONRY PARTITION DETAILS

SCALE: 1" = 1'-0"



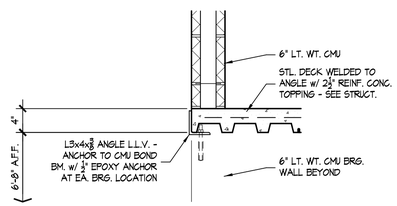
9 / A7.3 MEZZANINE DETAIL

SCALE: 1" = 1'-0"



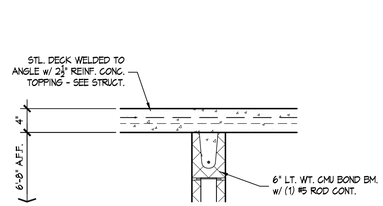
8 / A7.3 MEZZANINE DETAIL

SCALE: 1" = 1'-0"



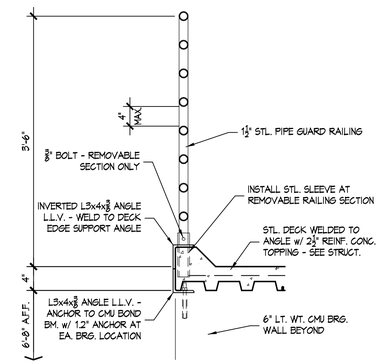
7 / A7.3 MEZZANINE DETAIL

SCALE: 1" = 1'-0"



6 / A7.3 MEZZANINE DETAIL

SCALE: 1" = 1'-0"

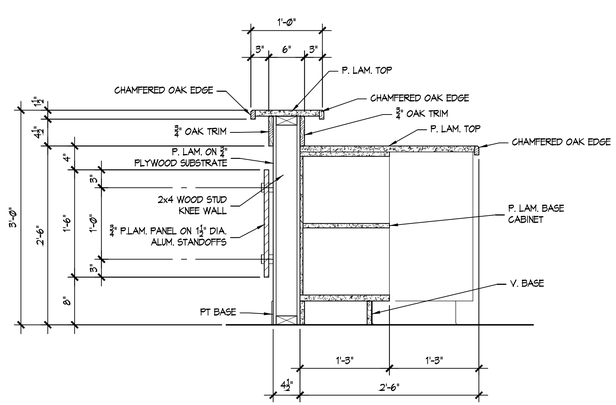


5 / A7.3 MEZZANINE DETAIL

SCALE: 1" = 1'-0"

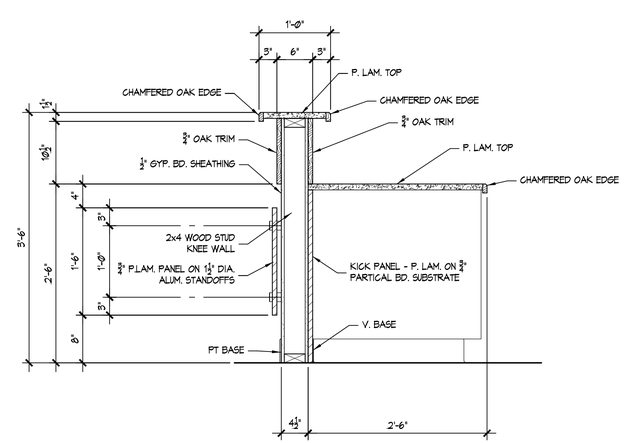
3 / A7.3 WALL DETAIL

SCALE: 1" = 1'-0"



11 / A7.3 RECEPTION COUNTER

SCALE: 1" = 1'-0"



10 / A7.3 RECEPTION COUNTER

SCALE: 1" = 1'-0"

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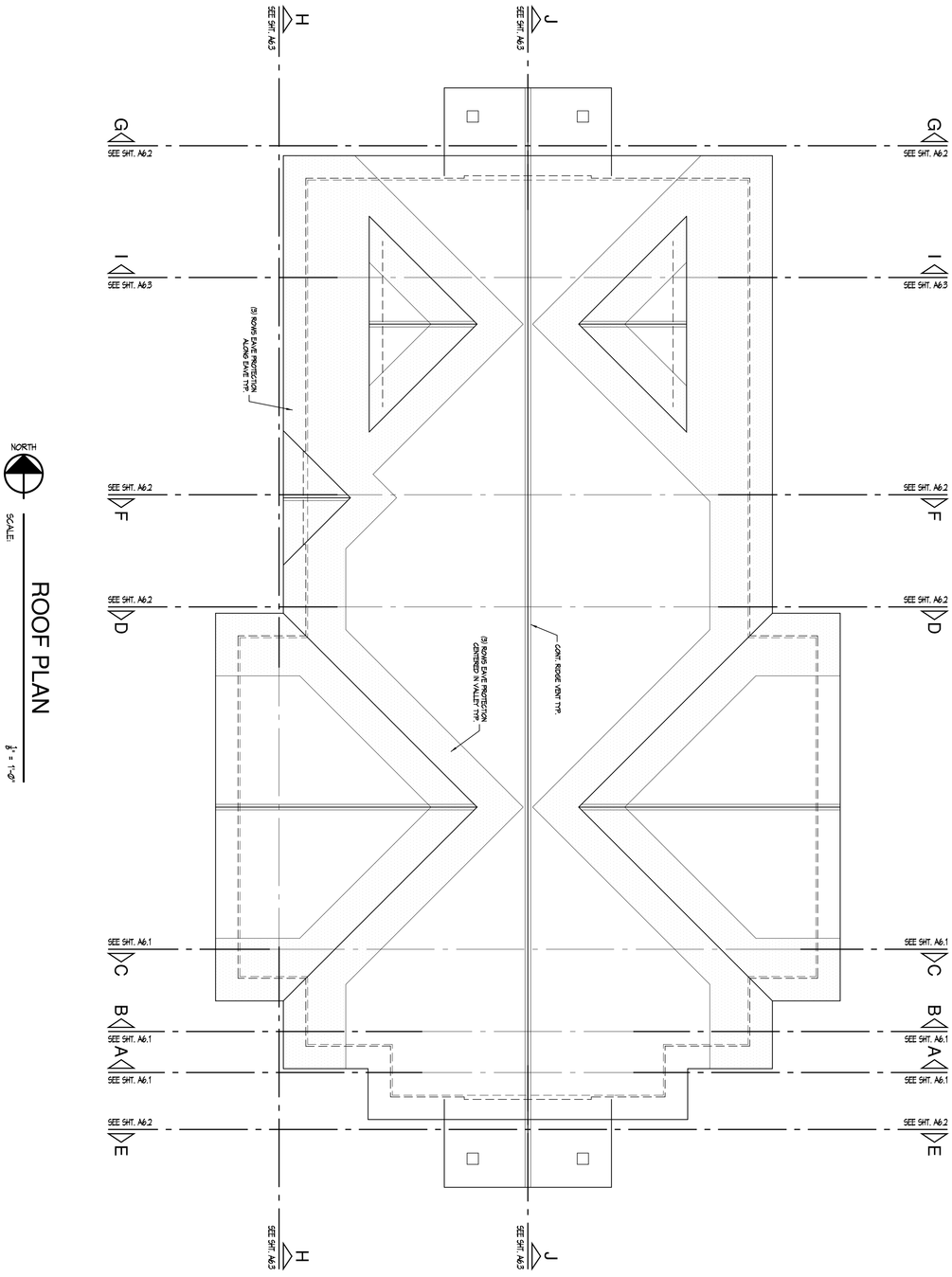
DRAWING TITLE: BUILDING DETAILS

PROJECT TITLE: PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY, GAYLORD, MICHIGAN

PROJECT NO.: 0160-10

DATE: APRIL 4, 2011

SHEET: A7.3



ROOF PLAN

SHEET	DATE	PROJECT NO.	PROJECT TITLE	DRAWING TITLE
A8.1	APRIL 4, 2011	0160-10	PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY GAYLORD, MICHIGAN	ROOF PLAN

ANTHONY P. ESSON
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TELEPHONE: (989) 732-0585

GENERAL STRUCTURAL NOTES

1. THE GENERAL STRUCTURAL NOTES ARE INTENDED TO AUGMENT THE DRAWINGS. AND SPECIFICATIONS. SHOULD CONFLICTS OCCUR BETWEEN THE DRAWINGS AND/OR THE GENERAL STRUCTURAL NOTES, THE STRICTEST PROVISION SHALL GOVERN.
2. THE CONTRACT STRUCTURAL DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED, SELF SUPPORTING, STABLE STRUCTURE UNLESS OTHERWISE INDICATED. THEY DO NOT INDICATE THE MEANS OR METHOD OF CONSTRUCTION. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND CONSTRUCTION SEQUENCE AND PROVIDE ALL MEASURES NECESSARY TO ENSURE THE STABILITY AND SAFETY OF THE STRUCTURE AND ITS COMPONENTS THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, BRACING, SHORING FOR CONSTRUCTION EQUIPMENT, SHORING FOR THE BUILDING, SHORING FOR EARTH BANKS, FORMS, SCAFFOLDING, PLANKING, SAFETY NETS, SUPPORT AND BRACING FOR CRANES AND GIN POLES, ETC.
3. THE GOVERNING BUILDING CODE IS MBC 2009.
4. SHOP DRAWINGS PREPARED BY SUPPLIERS, SUBCONTRACTORS, ETC. SHALL BE REVIEWED BY THE ARCHITECT/ENGINEER FOR CONFORMANCE WITH DESIGN INTENT ONLY.
5. CONTRACTOR IS RESPONSIBLE TO VERIFY ALL RELEVANT DIMENSIONS AND ELEVATIONS FOR EQUIPMENT INSTALLATIONS AGAINST APPROVED MANUFACTURERS CERTIFIED EQUIPMENT DRAWINGS.
6. UNLESS NOTED OTHERWISE, REQUIREMENTS GIVEN FOR ONE OR MORE LOCATIONS ALSO APPLY AT OTHER LOCATIONS AT WHICH CONDITIONS ARE SIMILAR. THE REQUIREMENTS GIVEN SHALL BE ADAPTED TO CONDITIONS AT SUCH OTHER LOCATIONS.
7. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL DIMENSIONS AND ELEVATIONS SHOWN ON THE PLANS AND FOR COORDINATING ALL DIMENSIONS AND ELEVATIONS SHOWN ON THE STRUCTURAL DRAWINGS WITH THOSE SHOWN ON THE ARCHITECTURAL AND MECHANICAL DRAWINGS. IF DISCREPANCIES IN THE DIMENSIONS OCCUR, IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO BRING THE DISCREPANCY TO THE ATTENTION OF THE ARCHITECT BEFORE PROCEEDING WITH THE WORK.

BACKFILLING NOTES

1. PROVIDE A BALANCED BACKFILL AGAINST FOUNDATION WALLS TO ELIMINATE LATERAL LOAD EFFECTS, OR PROVIDE NECESSARY TEMPORARY LATERAL SUPPORT TO THE TOP OF THE WALL UNTIL PERMANENT SUPPORT IS INSTALLED.
2. AFTER EXCAVATING FOR ALL EARTH-SUPPORTED FLOOR SLABS, THE EXPOSED NATURAL SOIL SHALL BE THOROUGHLY COMPACTED PRIOR TO PLACING FILL.
3. ALL EXCAVATED AREAS AROUND STRUCTURES SHALL BE BACKFILLED WITH GRANULAR MATERIAL FREE OF ORGANIC MATTER, SILT AND CLAY. ALL FILL SLOPES SHALL BE PLACED IN 12" LAYERS AND COMPACTED TO 95% MAXIMUM DENSITY AS DETERMINED BE THE MICHIGAN CONE METHOD.
4. BACKFILL MATERIAL SHALL BE COMPACTED TO 95% OF MAXIMUM DENSITY, AS DETERMINED BY THE MODIFIED PROCTOR METHOD (ASTM D1557), IN LIFTS NOT EXCEEDING 6".

CAST IN PLACE CONCRETE NOTES

1. ALL CONCRETE WORK SHALL BE DONE IN ACCORDANCE WITH THE LATEST ACI 318 CODE REQUIREMENTS AND STANDARDS.
2. CONCRETE SHALL BE A MINIMUM OF F'c = 3,500 psi AT 28 DAYS.
3. ALL REBAR SHALL BE HIGH STRENGTH NEW BILLET STEEL CONFORMING TO ASTM A615 GRADE 60. ALL DETAILS AND ACCESSORIES SHALL CONFORM TO THE LATEST ACI 315 STANDARD DETAILING MANUAL.
4. ALL WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185.
5. ALL WELD PLATES AND MISCELLANEOUS STEEL SHALL BE Fy = 36 ksi.
6. WELDED CONNECTIONS SHALL CONFORM TO THE AWS STRUCTURAL WELDING CODE AND USE 60 ksi ELECTRODES.
7. REINFORCEMENT PROTECTION SHALL BE AS FOLLOWS U.O.N.
   CONCRETE POURED AGAINST EARTH 3"
   ALL OTHER CONCRETE 2"
8. ALL EMBEDDED ITEMS SHALL BE PLACED IN THE FORMWORK PRIOR TO PLACING CONCRETE. DRILLING AND GROUTING IS ACCEPTABLE SUBJECT TO ENGINEER APPROVAL.
9. ALL BOLTS, NUTS, WASHERS, PLATES, AND ANCHOR BOLTS IN DIRECT OR INTERMITTENT CONTACT WITH WATER SHALL BE HOT DIPPED GALVANIZED PER LATEST ASTM STANDARDS.
10. ALL FOOTINGS AND SLABS SHALL BEAR ON SAND COMPACTED TO 98% MAXIMUM DENSITY AS DETERMINED BY THE MODIFIED PROCTOR METHOD.
11. ALL SLABS ON GRADE SHALL BEAR ON NATURAL SAND SOILS. PROVIDE A VAPOR BARRIER AS CALLED FOR ON THE PLANS AND PITCH ALL SLABS TO DRAIN WHERE INDICATED WITHOUT REDUCING THE THICKNESS OF THE SLAB.
12. FIELD BEND BARS COLD. DO NOT FIELD BEND BARS WITH HEAT OR BARS PARTIALLY EMBEDDED IN CONCRETE.
13. ALL EXTERIOR CONCRETE INCLUDING WALLS SHALL BE AIR-ENTRAINED.
14. FOR CONCRETE SLABS ON GRADE, PROVIDE CONTROL JOINTS (CJ) AT A MINIMUM OF 20'-0" o.c UNLESS OTHERWISE CALLED OUT.
15. SEE ARCHITECTURAL DRAWINGS FOR ALL FLOOR FINISHES, SLOPES, FLOOR DRAINS, ETC. NOT SHOWN ON FOUNDATION PLANS.

MASONRY WALL NOTES

1. ALL MASONRY SHALL BE F'm = 1,500 psi.
2. ALL GROUT SHALL BE F'c = 3,000 psi.
3. MORTAR FOR ALL BEARING AND EXTERIOR WALLS SHALL BE TYPE M. INTERIOR NON-BEARING WALLS SHALL BE TYPE N.
4. PROVIDE AN 8" BOND BEAM W/ (2) #5's, GROUTED SOLID AT THE TOP OF ALL WALLS.
5. PROVIDE (1) #5 VERTICAL REBAR, GROUTED SOLID AT 48" oc ON ALL WALLS. PROVIDE 9 GAGE LADDER OR TRUSS BED REINFORCEMENT EVERY 2nd COURSE ON ALL BLOCK WALLS.
6 . ALL WALL CORNERS & INTERSECTIONS SHALL BE FULL DEPTH INTERLOCKING JOINTS WITH CONTINUOUS CORNER AND INTERSECTION BED REINFORCEMENT.
7. GROUTING OF MASONRY WALLS SHALL BE CONFORM TO RECOMMENDED PROCEDURE FOR LOW LIFT GROUTING OR HIGH LIFT GROUTING AS OUTLINED IN THE NCMA-TEK NOTE 3-2, "GROUTING CONCRETE MASONRY WALLS".

WOOD FRAMING NOTES

1. ALL FRAMING LUMBER SHALL BE SPF #2 OR BETTER, EXCEPT SILL PLATES AND TOP PLATES WHICH SHALL BE SYP NO. 2 OR BETTER. LUMBER LABELED PT SHALL BE SP #2 OR BETTER.
2. ALL LVL'S SHALL BE LP LVL2950Fb-2.0E OR BETTER.
3. STEEL PLATES OR FASTENERS IN CONTACT WITH PRESSURE TREATED LUMBER AND PROTECTED WITHIN THE BUILDING ENVELOPE (ADEQUATELY SHIELDED FROM DIRECT CONTACT WITH MOISTURE) SHALL BE STAINLESS STEEL OR GALVANIZED TO G60 PER ASTM A 924 REQUIREMENTS. STEEL PLATES OR FASTENERS IN CONTACT WITH PRESSURE TREATED LUMBER LOCATED OUTSIDE OF THE BUILDING ENVELOPE OR EXPOSED TO MOISTURE SHALL BE STAINLESS STEEL OR GALVANIZED TO G90 PER ASTM A 924.
4. CONTRACTOR SHALL NOT MIX GALVANIZED AND STAINLESS STEEL. ANY METAL PARTS IN CONTACT WITH OTHER METAL PARTS SHALL BE OF A SIMILAR MATERIAL.

WOOD TRUSS NOTES

1. CONTRACTOR SHALL PROVIDE AND INSTALL METAL-PLATE CONNECTED WOOD TRUSSES DESIGNED TO SUPPORT THE LOADS INDICATED ON THE PLANS. TRUSSES SHALL HAVE A MAXIMUM DEFLECTION OF L/360 AND SHALL BE SPACED AT 2'-0" O.C. MAX.
2. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS SEALED BY A STRUCTURAL ENGINEER LICENSED IN THE STATE OF MICHIGAN. SHOP DRAWINGS FOR EACH TRUSS SHALL SHOW SIZE, SPECIES AND STRESS GRADES OF ALL LUMBER, METAL PLATE TYPE, ORIENTATION AND SIZES, BEARING AND UPLIFT REQUIREMENTS. ALL LOAD CASES INVESTIGATED AND MAXIMUM STRESSES IN EACH MEMBER SHALL ALSO BE INCLUDED.
3. TRUSS MANUFACTURER SHALL DESIGN TRUSSES FOR WIND LOADS PER SECTION OF SEI/ASCE 7-05.
4. WOOD TRUSS FABRICATION SHALL COMPLY WITH TPI 1-95, "NATIONAL DESIGN STANDARD FOR METAL PLATE CONNECTED WOOD TRUSS CONSTRUCTION" AND TPI DSB-89, "RECOMMENDED DESIGN SPECIFICATION FOR TEMPORARY BRACING OF METAL PLATE CONNECTED WOOD TRUSSES".
5. METAL PLATE CONNECTORS SHALL COMPLY WITH TPI 1, HOT-DIP GALVANIZED STEEL SHEET: ASTM A653/A653 M, G60 COATING DESIGNATION; DESIGNATION SS, GRADE 33, AND NOT LESS THAN 0.036 IN. THICK.
6. PROVIDE DIMENSIONAL LUMBER OF ANY SPECIES FOR TRUSS CHORD AND WEB MEMBERS, CAPABLE OF SUPPORTING THE REQUIRED LOADS WITHOUT EXCEEDING ALLOWABLE DESIGN VALUES ACCORDING TO AFPA'S "NATIONAL DESIGN SPECIFICATIONS FOR WOOD CONSTRUCTION" AND ITS "SUPPLEMENT".
7. CONTRACTOR SHALL INSTALL SIMPSON STRONG-TIE H3 HURRICANE TIE-DOWNS (OR EQUAL) AT ALL BEARING LOCATIONS OF ALL TRUSSES AS FOLLOWS (U.O.N.)
8. TRUSS MANUFACTURER SHALL DESIGN TRUSS BEARINGS FOR 425 PSI ALLOWABLE BEARING PRESSURE. TRUSS MANUFACTURER SHALL ATTACH HEEL BLOCKS AS NECESSARY TO ACHIEVE THIS REQUIREMENT.
9. TRUSSES SHALL BE HANDLED AND INSTALLED PER WTCA AND TPI REQUIREMENTS. INSTALL AND FASTEN PERMANENT BRACING DURING TRUSS ERECTION AND BEFORE LOADS ARE APPLIED.
10. ANCHOR ENDS OF PERMANENT BRACING WHERE TERMINATING AT WALLS OR BEAMS. IN ADDITION TO ANY LATERAL BRACING WHICH IS REQUIRED BY THE TRUSS MANUFACTURER/SUPPLIER, THE CONTRACTOR SHALL PROVIDE AND INSTALL PERMANENT DIAGONAL STABILITY BRACING FOR ALL COMPRESSION WEBS AND PRIMARY TOP CHORDS OF PIGGY BACK TRUSSES OR OTHER MEMBERS WHICH REQUIRE BRACING TO REDUCE THEIR BUCKING LENGTH. THIS BRACING SHALL CONSIST OF 2X4's ATTACHED TO EACH WEB MEMBER WITH NOT LESS THEN 2 - 16d NAILS. BRACING SHALL EXTEND ON A 45 DEGREE DIAGONAL FROM THE TOP TO BOTTOM OF THE WEBS. FOR EACH BRACED MEMBER, DIAGONALS SHALL BE INSTALLED IN CHEVRON PAIRS WITH ONE PAIR OF DIAGONALS AT EACH END OF THE SERIES OF TRUSSES AND NOT MORE THAN 20 FEET BETWEEN PAIRS.

BUILDING LOADS		
LIVE LOADS Section 1603.1.1		
OCCUPANCY OR USE	UNIFORM (PSF)	CONCENTRATED (LBS.)
BUSINESS		
STORAGE ROOMS	125	
CORRIDORS (MAIN FLOOR)	100	
OFFICES	50	
LOBBIES	100	
STAIRS & EXITS	100	300
MEZZANINE STORAGE and MECHANICAL	125	

ROOF SNOW LOADS Section 1603.1.3	
LOAD TYPE	UNIFORM (PSF)
1. GROUND SNOW LOAD, Pg	60
2. FLAT ROOF SNOW LOAD, Pf	46.2
3. SLOPED ROOF SNOW LOAD, Ps	46.2
4. UNBALANCED SNOW LOADS	13.9/76.3
5. SNOW DRIFT LOADS (ON LOWER CANOPY ROOFS)	144.8
SNOW LOAD FACTORS	VALUE
1. SNOW EXPOSURE FACTOR, Ce	1.0
2. SNOW LOAD IMPORTANCE FACTOR, Is	1.0
3. THERMAL FACTOR, Ct	1.1
4. ROOF SLOPE FACTOR, Cs	1.0

WIND LOADS Section 1603.1.4	
LOAD OR VARIABLE	VALUE
1. BASIC WIND SPEED (3-SECOND GUST)	90 MPH
2. WIND IMPORTANCE FACTOR, Iw	1.00
3. WIND EXPOSURE CATEGORY	B
4. MAIN WIND FORCE RESISTING SYSTEM (MAX ROOF UPLIFT)	17.3 PSF
5. MAIN WIND FORCE RESISTING SYSTEM (MAX WALL)	16.9 PSF
6. COMPONENTS & CLADDING DESIGN PRESSURE (ZONE 1)	+10,-13.3 PSF
7. COMPONENTS & CLADDING DESIGN PRESSURE (ZONE 2)	+10,-23.2 PSF
8. COMPONENTS & CLADDING DESIGN PRESSURE (ZONE 3)	+10,-34.3 PSF
9. COMPONENTS & CLADDING DESIGN PRESSURE (ZONE 4)	+14.6,-15.8 PSF
10. COMPONENTS & CLADDING DESIGN PRESSURE (ZONE 5)	+14.6,-19.5 PSF
11. INTERNAL PRESSURE COEFFICIENT	±0.18

EARTHQUAKE DESIGN DATA Section 1603.1.5	
LOAD OR VARIABLE	VALUE
1. SEISMIC USE GROUP	I
2. SPECTRAL RESPONSE ACCELERATION, Ss	0.04g
3. SPECTRAL RESPONSE COEFFICIENT	0.04g
4. SITE CLASS	D
5. SEISMIC DESIGN CATEGORY	A
6. BASIC SEISMIC-FORCE-RESISTING SYSTEM USED: ORDINARY REINFORCED MASONRY AND WOOD FRAMED SHEAR WALLS.	
7. SEISMIC IMPORTANCE FACTOR I_E = 1.0	
8. MINIMUM LATERAL FORCE ANALYSIS PROCEDURE, SECTION 1616.4	

SOIL BEARING STRENGTH Section 1802.6
ASSUMED SOIL BEARING STRENGTH IS 1,750 PSF. CONTRACTOR SHALL VERIFY BEARING STRENGTH BY SOIL BORINGS OR OTHER MEANS.

NOTES:

1. APPLICABLE CODE IS MBC 2009.
2. LOADS ARE BASED ON SECTION 16 OF MBC 2009 UNLESS OTHERWISE NOTED.

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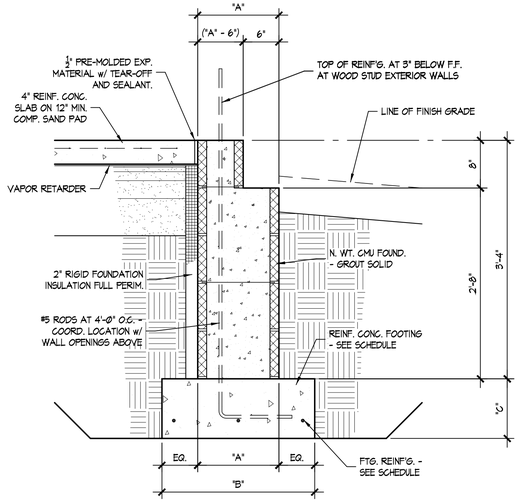
DRAWING TITLE
STRUCTURAL NOTES & INFO

PROJECT TITLE
PROPOSED NEW ANIMAL CONTROL FACILITY FOR:
OTSEGO COUNTY
GAYLORD, MICHIGAN

PROJECT NO. 0160-10

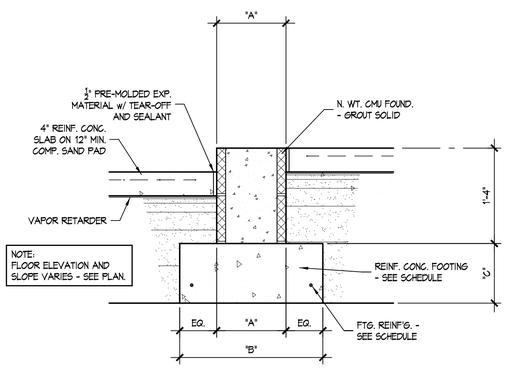
DATE APRIL 4, 2011

SHEET S0.1



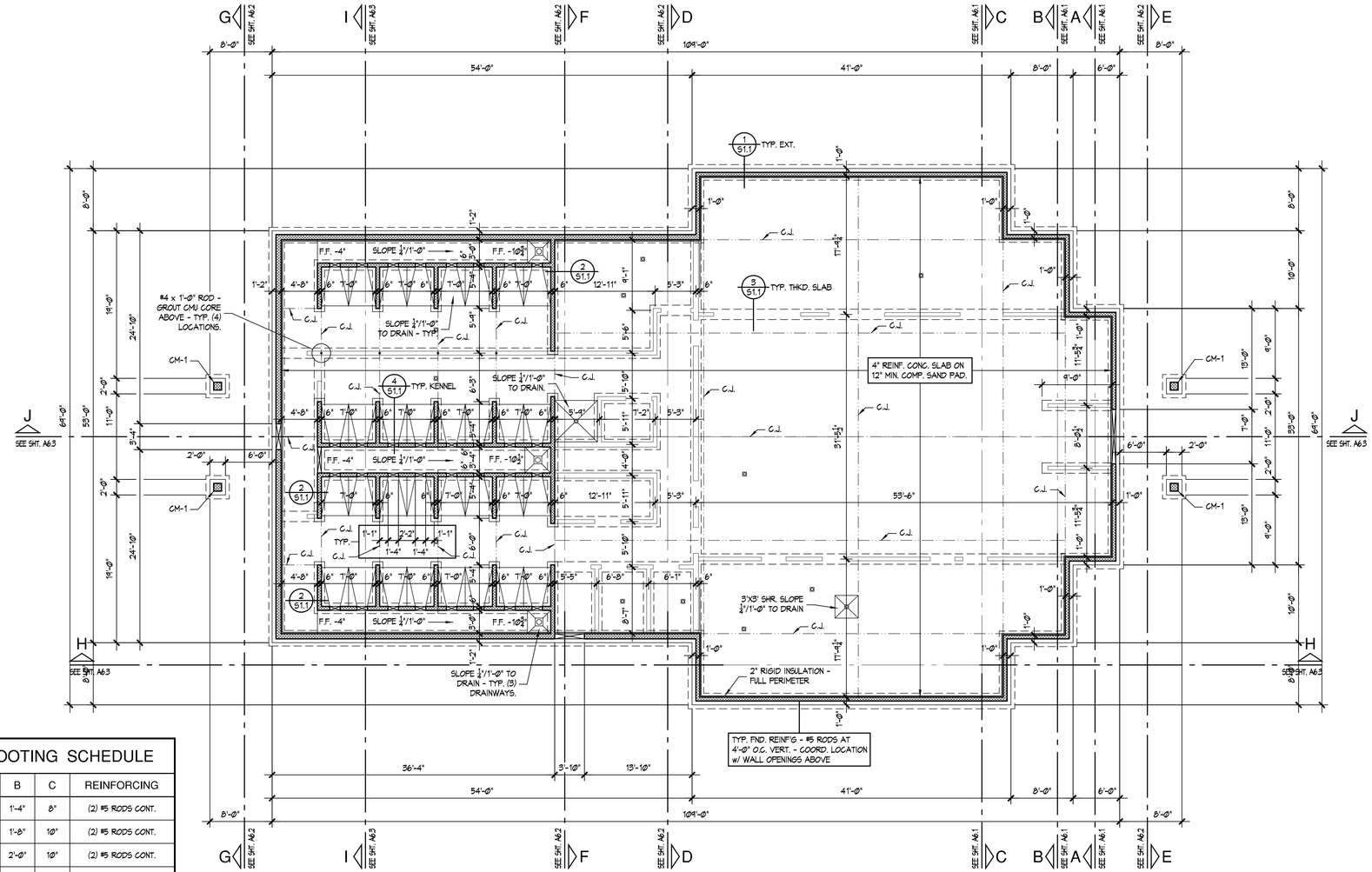
1 / S1.1 TYP. EXT. FOUNDATION DETAIL

SCALE: 1" = 1'-0"



2 / S1.1 TYP. INT. FOUNDATION DETAIL

SCALE: 1" = 1'-0"

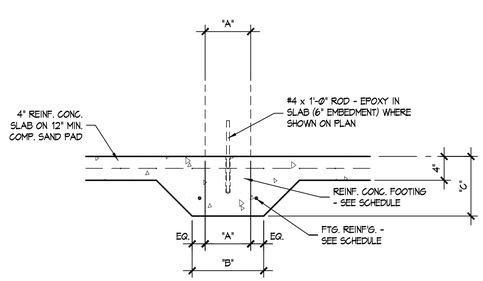


FOUNDATION PLAN

SCALE: ⅛" = 1'-0"

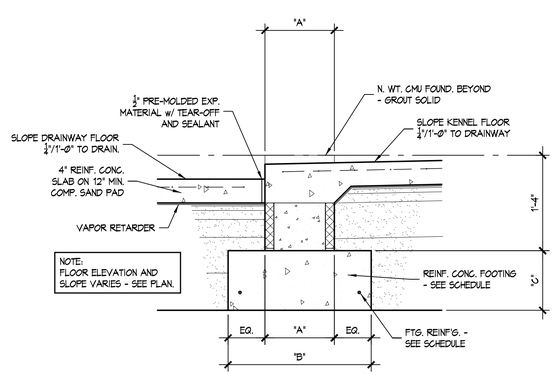
FOOTING SCHEDULE			
A	B	C	REINFORCING
6"	1'-4"	8"	(2) #5 RODS CONT.
8"	1'-8"	10"	(2) #5 RODS CONT.
12"	2'-0"	10"	(2) #5 RODS CONT.
1'-2"	2'-6"	10"	(3) #5 RODS CONT.

NOTE: SEE SPECIFICATIONS FOR TYPICAL CONTROL JOINT LOCATION REQUIREMENTS.



3 / S1.1 TYP. THKD. SLAB DETAIL

SCALE: 1" = 1'-0"

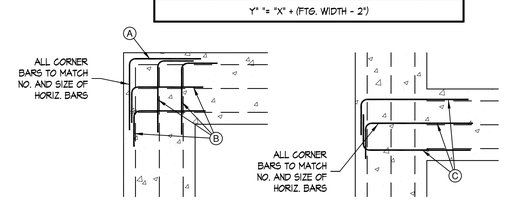


4 / S1.1 TYP. KENNEL FOUNDATION DETAIL

SCALE: 1" = 1'-0"

NORMAL WEIGHT CONCRETE REINF'G LAP LENGTH SCHEDULE				
BAR SIZE	STANDARD CLASS A SPLICE	TOP BAR CLASS A SPLICE	STANDARD CLASS B SPLICE	TOP BAR CLASS B SPLICE
#3	1'-4"	1'-8"	1'-8"	2'-2"
#4	1'-9"	2'-3"	2'-3"	2'-11"
#5	2'-2"	2'-9"	2'-9"	3'-7"
#6	2'-7"	3'-4"	3'-4"	4'-4"
#7	3'-9"	4'-10"	4'-10"	6'-3"
#8	4'-3"	5'-6"	5'-6"	7'-2"
#9	4'-9"	6'-3"	6'-3"	8'-1"
#10	5'-4"	6'-11"	6'-11"	9'-0"
#11	5'-10"	7'-7"	7'-7"	9'-10"
WIRE MESH IN SLABS	OVERLAP BETWEEN LAST CROSS WIRE OF EACH FABRIC = WIRE SPACING + 2" -> MIN 8" LAP			
BASED OFF OF ACI 318-02, F'c = 3500 psi				
TOP BAR = HORIZONTAL REINFORCEMENT SO PLACED THAT MORE THAN 12" OF FRESH CONCRETE IS CAST BELOW THE DEVELOPMENT LENGTH OR SPLICE.				

CORNER BAR SCHEDULE			"Y" (A)	"Y" (B)	"Y" (C)
BAR SIZE	"X"	"Z"	BAR SIZE	"X"	"Z"
#4	2'-1"	10"	#8	5'-2"	1'-7"
#5	2'-7"	1'-0"	#9	5'-10"	2'-0"
#6	3'-1"	1'-3"	#10	6'-6"	2'-3"
#7	4'-6"	1'-5"	#11	7'-1"	7'-1"
Y" = "X" + (FTG. WIDTH - 2")					



TYP. CORNER REINF'G DETAIL

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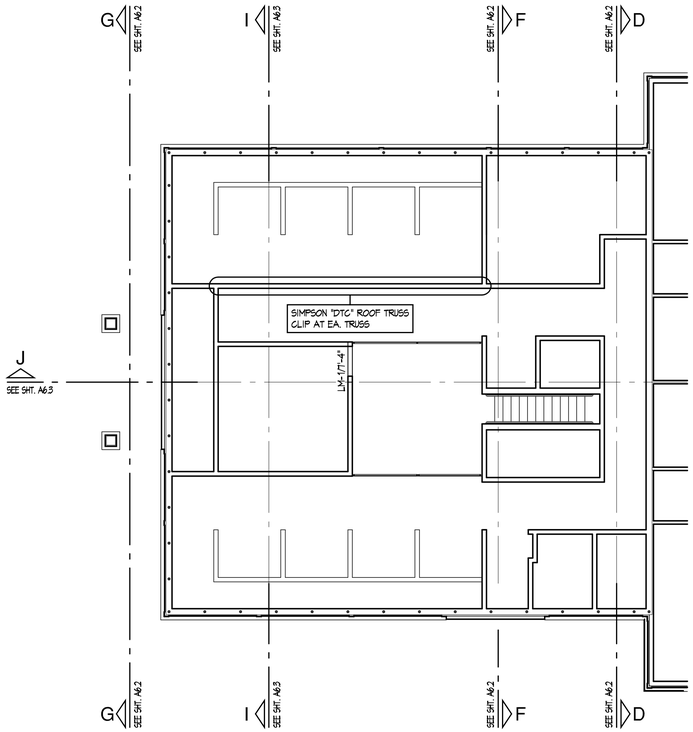
DRAWING TITLE
FOUNDATION PLAN
FOUNDATION DETAILS

PROJECT TITLE
PROPOSED NEW ANIMAL CONTROL FACILITY FOR:
OTSEGO COUNTY
GAYLORD, MICHIGAN

PROJECT NO. 0160-10

DATE APRIL 4, 2011

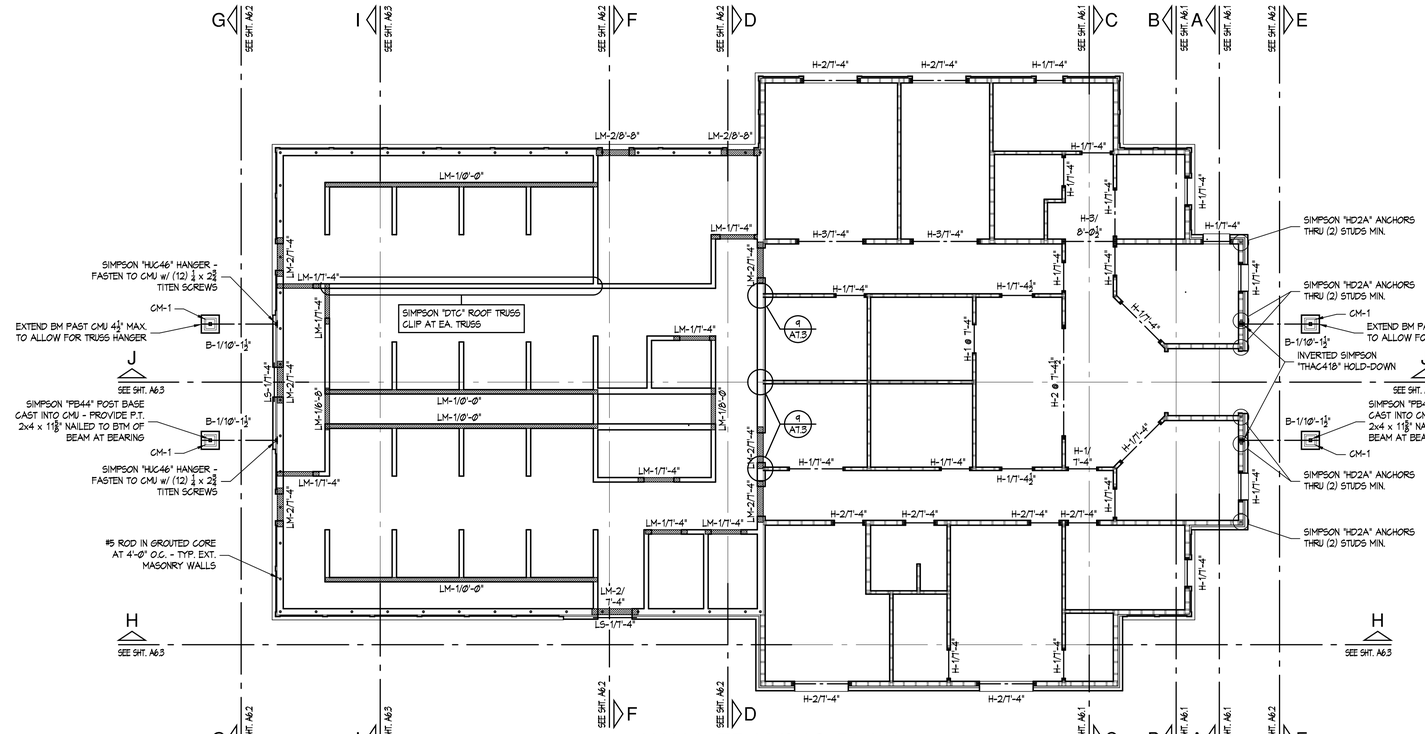
SHEET S1.1



MEZZANINE WALL FRAMING PLAN

NORTH

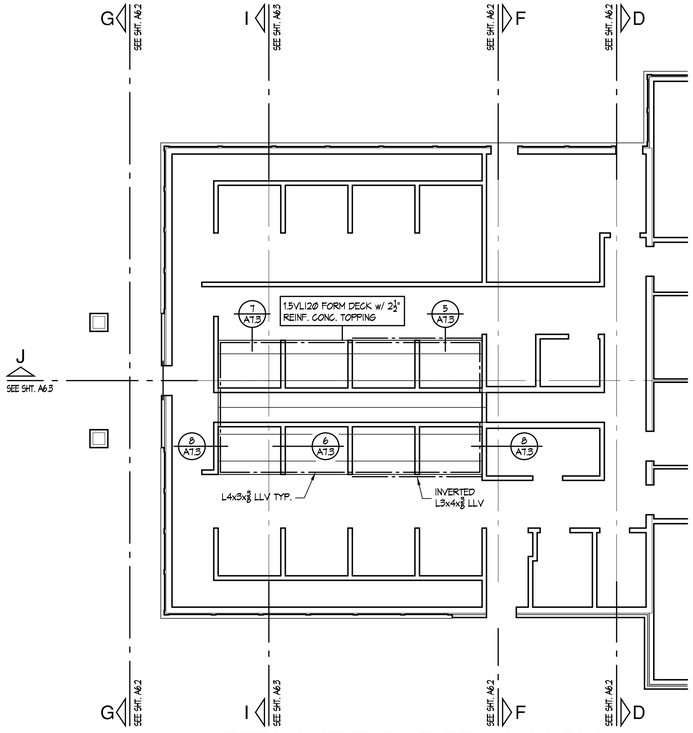
SCALE: 1/8" = 1'-0"



WALL FRAMING PLAN

NORTH

SCALE: 1/8" = 1'-0"



MEZZANINE FLOOR FRAMING PLAN

NORTH

SCALE: 1/8" = 1'-0"

MASONRY LINTEL SCHEDULE

TAG	SIZE	SPAN	REINF.	SHAPE
LM-1	6"x8"	SEE PLAN	(1) #5	U
LM-2	8"x8"	SEE PLAN	(2) #5	U

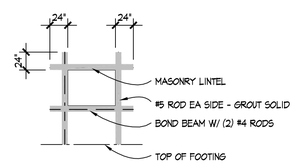
NOTE: PROVIDE A MASONRY LINTEL w/ (2) #4 RODS @ ALL LOCATIONS WHERE H.V.A.C. DUCTWORK LARGER THAN 12" WIDE PENETRATES MASONARY WALLS UNLESS INDICATED AND SCHEDULED OTHERWISE. SEE MECHANICAL PLANS.

C-X/YYYY'-Y"

C-X = LINTEL NUMBER
YYY'-Y" = BEARING ELEVATION

MASONRY LINTEL NOTES

1. ALL BEARING LOADS SHALL BE DISTRIBUTED THROUGH GROUTED CORES DOWN TO TOP OF FOOTING. REFER TO BEARING REINFORCMENT DIAGRAM THIS SHEET.
2. OPENINGS IN EXTERIOR MASONRY WALLS SHALL BE REINFORCED AS DETAILED IN DIAGRAM BELOW.
3. COORDINATE THE LOCATION AND PLACEMENT OF MASONRY LINTELS OVER MECHANICAL EQUIPMENT AND OR DUCTWORK WITH THE MECHANICAL CONTRACTOR.



OPENING REINFORCING DIAGRAM

CONCRETE COLUMN (CM-#) SCHEDULE

TAG	SIZE	REINF.	SHAPE
CM-1	1'-0"x1'-0"	(4) #5	□

CONCRETE COLUMN NOTES

1. POSITION VERTICAL REINFORCING 2" FROM FACE OF MASONRY UNIT. MAINTAIN REBAR POSITION DURING GROUTING OF CMU CORES.

MASONRY REINF'G LAP LENGTH SCHEDULE

BAR SIZE	GRADE 40 SPLICE	GRADE 60 SPLICE
#3	15"	18"
#4	20"	24"
#5	25"	30"
#6	30"	36"
#7	35"	42"
#8	40"	48"
#9	45"	54"
#10	50"	60"
#11	55"	66"

BASED OFF OF ACI 530-99/ASCE 5-99/ TMS 402-99

LOOSE STEEL LINTEL SCHED.

TAG	SIZE	SPAN	SHAPE
LS-1	L5x3 1/2x3/8	VARIES	L

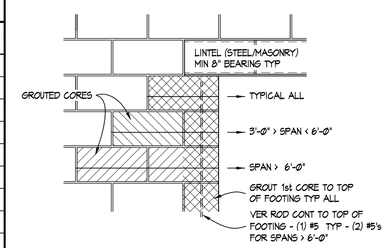
NOTE: PROVIDE A LS-1 LINTEL @ ALL LOCATIONS WHERE H.V.A.C. EQUIPMENT OR DUCTWORK PENETRATES EXTERIOR BRICK VENEER UNLESS INDICATED AND SCHEDULED OTHERWISE. SEE MECHANICAL PLANS.

S-X/YYY'-Y"

S-X = LINTEL NUMBER
YYY'-Y" = BEARING ELEVATION

STEEL LINTEL NOTES

1. HOT DIP GALVANIZE ALL STEEL LINTELS EXPOSED TO THE EXTERIOR.



BEARING REINFORCMENT DIAGRAM

WOOD HEADER SCHEDULE

TAG	HDR. SIZE/MATERIAL	JACK STUDS	KING STUDS
H-1	(2) 2x6 w/ 2x_ TOP AND BTM.	1	1
H-2	(2) 2x10 w/ 2x_ TOP AND BTM.	2	1
H-3	3 1/2x9 1/4 LVL w/ 2x6 TOP AND BTM.	2	1
OTHERS	AS SHOWN	AS SHOWN	AS SHOWN

WOOD BEAM SCHEDULE

TAG	HDR. SIZE/MATERIAL	JACK STUDS	CRIPPLE STUDS
B-1	3 1/2"x9 1/4" LVL	(3) 2x4	(2) 2x6

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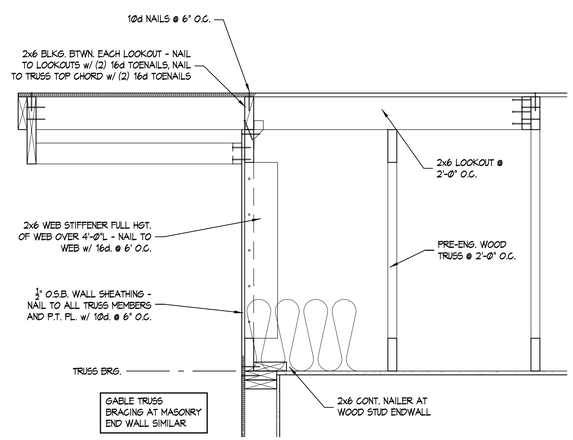
DRAWING TITLE: WALL/FLOOR FRAMING PLANS

PROJECT TITLE: PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY, GAYLORD, MICHIGAN

PROJECT NO. 0160-10

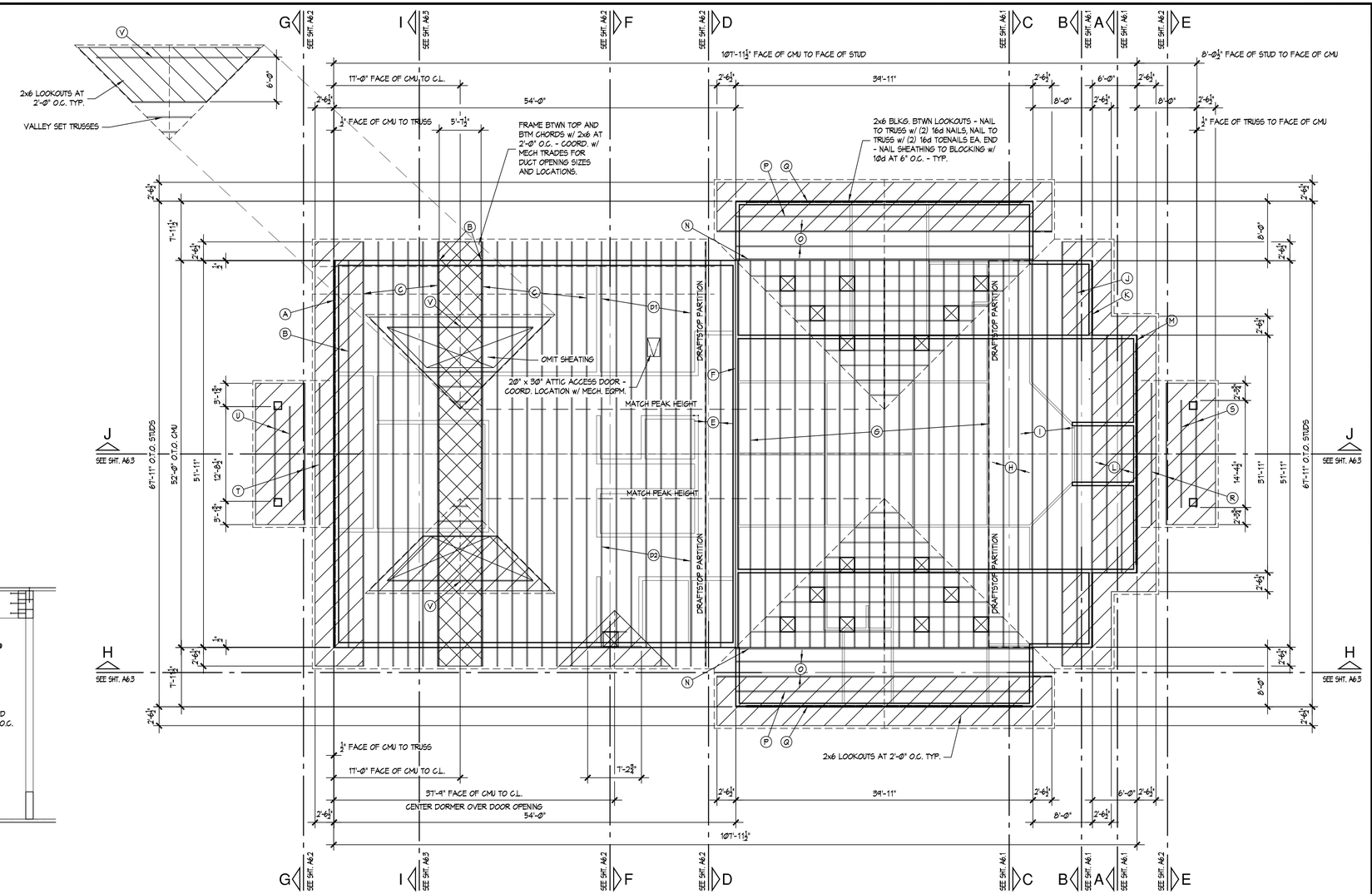
DATE APRIL 4, 2011

SHEET S2.1



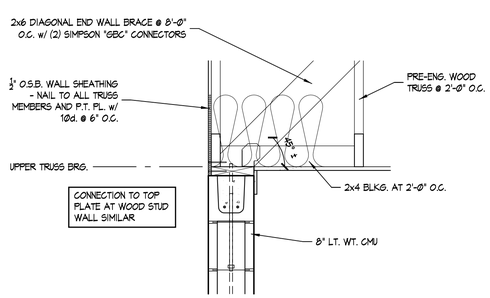
GABLE TRUSS WEB BRACE DETAIL

SCALE: 1" = 1'-0"

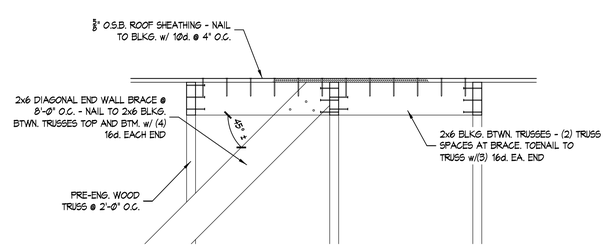


ROOF FRAMING PLAN

SCALE: 1/8" = 1'-0"



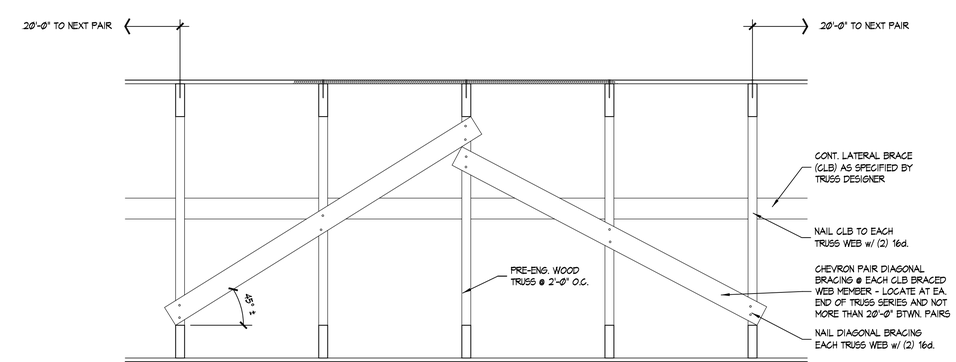
CONNECTION @ ENDWALL



CONNECTION @ ROOF SHEATHING

MASONRY ENDWALL BRACING DETAIL

SCALE: 1" = 1'-0"



TYP. PERMANENT DIAGONAL TRUSS BRACING

SCALE: 1" = 1'-0"

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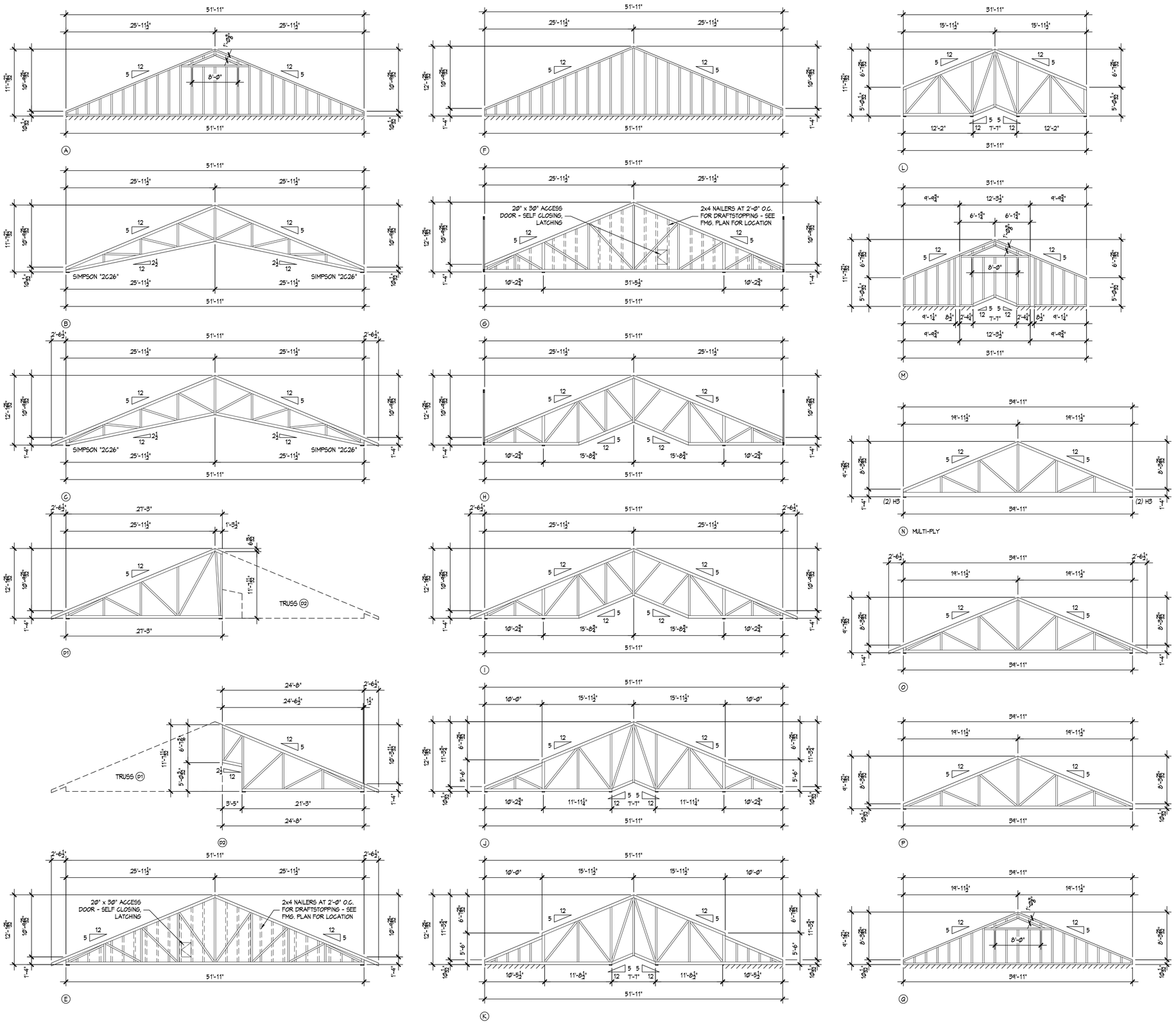
DRAWING TITLE
ROOF FRAMING PLAN
ROOF FRAMING DETAILS

PROJECT TITLE
PROPOSED NEW ANIMAL CONTROL FACILITY FOR:
OTSEGO COUNTY
GAYLORD, MICHIGAN

PROJECT NO. 0160-10

DATE APRIL 4, 2011

SHEET S3.1



NOTE:
PRE-ENGINEERED WOOD TRUSSES ARE TO BE DESIGNED TO SUPPORT UNIFORM IMPOSED DEAD LOADS OF 15 PSF ALONG TOP CHORD AND 5 PSF ALONG BOTTOM CHORD. IN ADDITION, TRUSS DESIGNER SHALL CONSIDER DEAD LOADS OF ALL TRUSS SUPPORTED HVAC EQUIPMENT IN THE DESIGN OF THE TRUSSES. REFER TO MECHANICAL DRAWINGS FOR EQUIPMENT SIZES AND LOCATIONS.

NOTE:
PROVIDE (1) SIMPSON "H3" CLIP AT EACH TRUSS BEARING UNLESS NOTED OTHERWISE ON TRUSS DIAGRAMS. WHERE TRUSSES ARE SUPPORTED BY HANGER FROM GRIDER TRUSS, TRUSS MANUFACTURER SHALL PROVIDE APPROPRIATE HANGER FOR BEARING CONDITIONS REQUIRED AND AS NECESSARY TO SUPPORT ALL SUPERIMPOSED LOADS.

NOTE:
TRUSS WEB LAYOUTS ARE FOR INFORMATIONAL PURPOSES ONLY. TRUSS MANUFACTURER MAY ADJUST WEB LAYOUT AS REQUIRED TO SUIT TRUSS DESIGN.

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DRAWING TITLE
ROOF TRUSS PROFILES

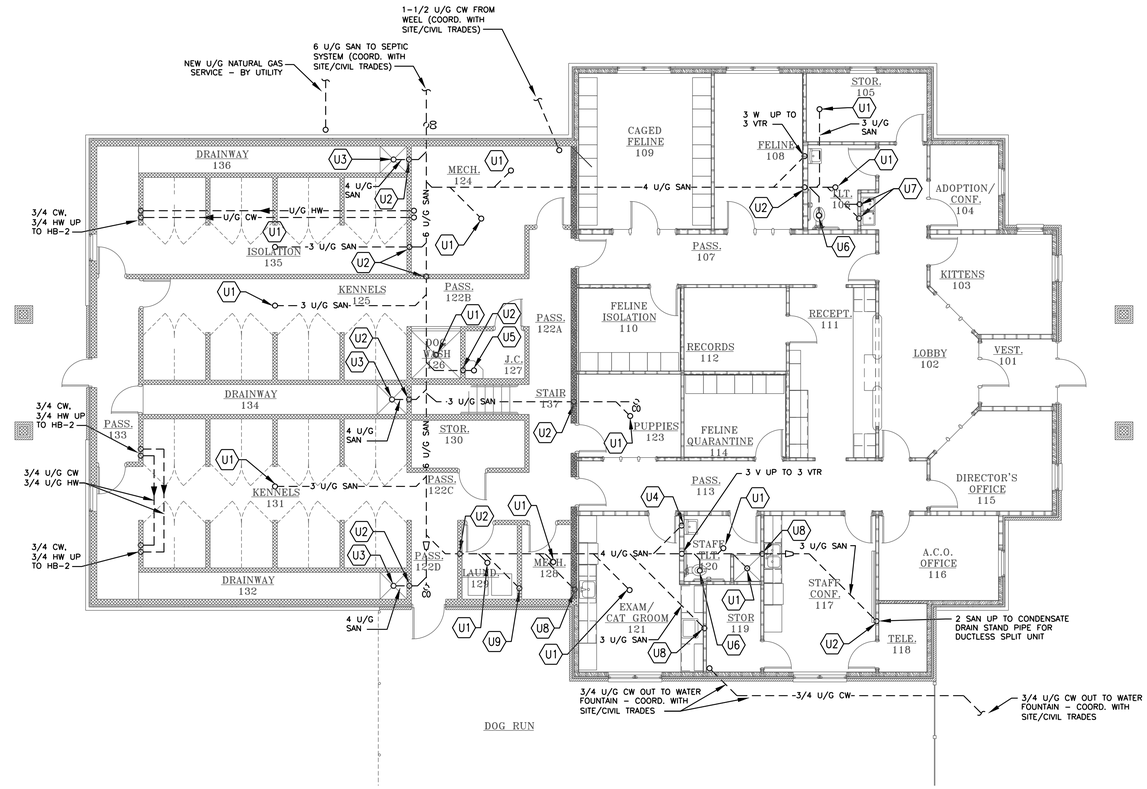
PROJECT TITLE
PROPOSED NEW ANIMAL CONTROL FACILITY FOR:
OTSEGO COUNTY
GAYLORD, MICHIGAN

PROJECT NO. 0160-10

DATE APRIL 4, 2011

SHEET S3.2

BID 2011-08 ANIMAL CONTROL FACILITY
Mechanical/Electrical Plans



NORTH

PLUMBING PLAN – BELOW GRADE

SCALE: 1/8" = 1'-0"

KEYED CONSTRUCTION NOTES:

- U1 3 W UP TO FLOOR DRAIN ABOVE. COORIDINATE FLOOR DRAIN LOCATIONS WITH M.C. PRIOR TO ROUGH-IN.
- U2 2 V UP, WITH WCO ABOVE - ROUTE TO 3 VTR.
- U3 4 W UP TO FLOOR DRAIN FD-F ABOVE.
- U4 2 W UP TO LAV-1.
- U5 3 W UP TO MS-1 ABOVE.
- U6 4 W UP TO WC-1 ABOVE.
- U7 1-1/2 W UP TO EWC-1 ABOVE.
- U8 2 W UP TO SINK ABOVE.
- U9 2 W UP TO WASHING MACHINE OUTLET BOX ABOVE.
- U10 3 W UP TO FLOOR SINK FS-1 ABOVE.

JLK Engineering Project Number: AEA11103-01

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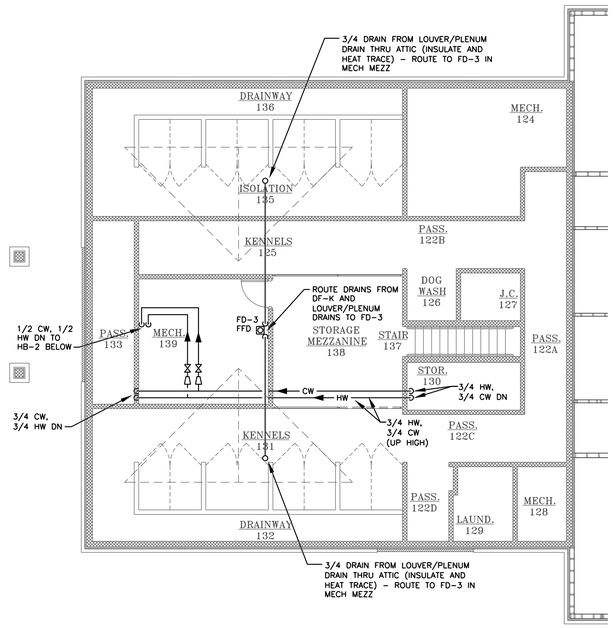
DRAWING TITLE: PLUMBING PLAN - BELOW GRADE

PROJECT TITLE: PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY, GAYLORD, MICHIGAN

PROJECT NO.: 0160-10

DATE: APRIL 4, 2011

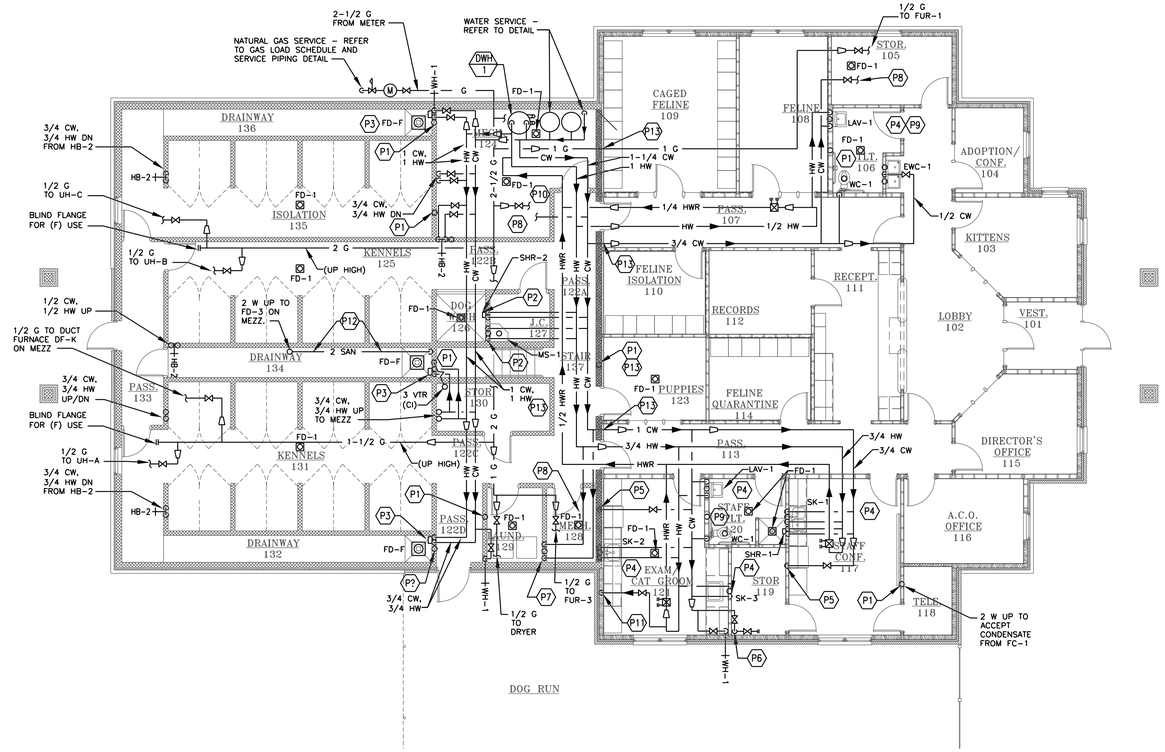
SHEET: P1



NORTH N

PLUMBING PLAN – MEZZANINE LEVEL

SCALE: 1/8" = 1'-0"



NORTH N

PLUMBING PLAN – FIRST FLOOR

SCALE: 1/8" = 1'-0"

PLUMBING CONNECTION SCHEDULE

FIXTURE TYPE	HOT WATER	COLD WATER	WASTE	TRAP	VENT
WATER CLOSET (FLUSH TANK)	--	1/2"	4"	--	2"
URINAL (FLUSH VALVE)	--	3/4"	2"	--	1-1/2"
LAVATORY	1/2"	1/2"	1-1/2"	1-1/2"	1-1/2"
SINK	1/2"	1/2"	1-1/2"	1-1/2"	1-1/2"
SERVICE/MOP SINK	1/2"	1/2"	3"	3"	3"
ELECTRIC WATER COOLER	--	1/2"	1-1/4"	1-1/4"	1-1/4"
SHOWER	1/2"	1/2"	3"	--	1-1/2"
HOSE BIB	3/4"	3/4"	--	--	--
WALL HYDRANT	--	3/4"	--	--	--

NOTES:
1. REFER TO DRAWINGS AND SPECIFICATIONS FOR MORE DETAILS.

KEYED CONSTRUCTION NOTES:

P1 2V DN, WITH WALL CLEAN OUT. 2V UP, ROUTE TO 3 VTR.

P2 COORDINATE MOUNTING HEIGHT OF DOG WASH SHOWER UNIT WITH OWNER PRIOR TO ROUGH-IN.

P3 FLUSHING FLOOR DRAIN WATER SUPPLY CONTROL BOX (PROVIDED WITH FD-F). SURFACE MOUNT AT 48" AFF. ROUTE 1/2 CW, 1/2 HW TO CONTROL BOX SUPPLY CONNECTIONS. ROUTE 3/4 TEMPERED SUPPLY WATER FROM CONTROL BOX TO FD-F's 3/4" FLUSHING RIM CONNECTION AND 3/8" TRAP FLUSH CONNECTION.

P4 1/2 CW, 1/2 HW DOWN TO LAV/SINK. 1-1/2 W DOWN, WITH WCO, 1-1/2 V UP – ROUTE TO 3 VTR.

P5 1/4 CW DN TO REFRIGERATOR SUPPLY BOX.

P6 3/4" CW DN THRU FLOOR AND OUT TO OUTDOOR WATER FOUNTAIN (CORD. WITH SITE/CIVIL TRADES). PROVIDE ISOLATION VALVE AND COMPRESSED AIR VALVED TEE FOR BLOWING OUT UNDERGROUND SUPPLY LINE.

P7 1/2 CW, 1/2 HW DN WASHING MACHINE SUPPLY BOX.

P8 1/4 CW, WITH ISOLATION VALVE, TO FURNACE HUMIDIFIER.

P9 3 V DN, 3 V UP TO 3 VTR.

P10 1/2 G TO FURNACE.

P11 1/2 HW TO DISHWASHER.

P12 1 SAN UP HIGH IN DRAINWAY 134 (PVC). TERMINATE NEAR FD-F.

P13 COORDINATE SIZE/LOCATION OF ALL DUCT/PIPE PENETRATIONS THRU LOAD BEARING WALLS/FLOORS/MEMBERS WITH STRUCTURAL TRADES FOR LINTELS, BEAMS, ETC. PRIOR TO ROUGH-IN.

JLK Engineering Project Number: AEA11103-01

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DRAWING TITLE: PLUMBING PLAN - ABOVE GRADE

PROJECT TITLE: PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY, GAYLORD, MICHIGAN

PROJECT NO. 0160-10

DATE APRIL 4, 2011

SHEET P2

PLUMBING SPECIALTIES SCHEDULE

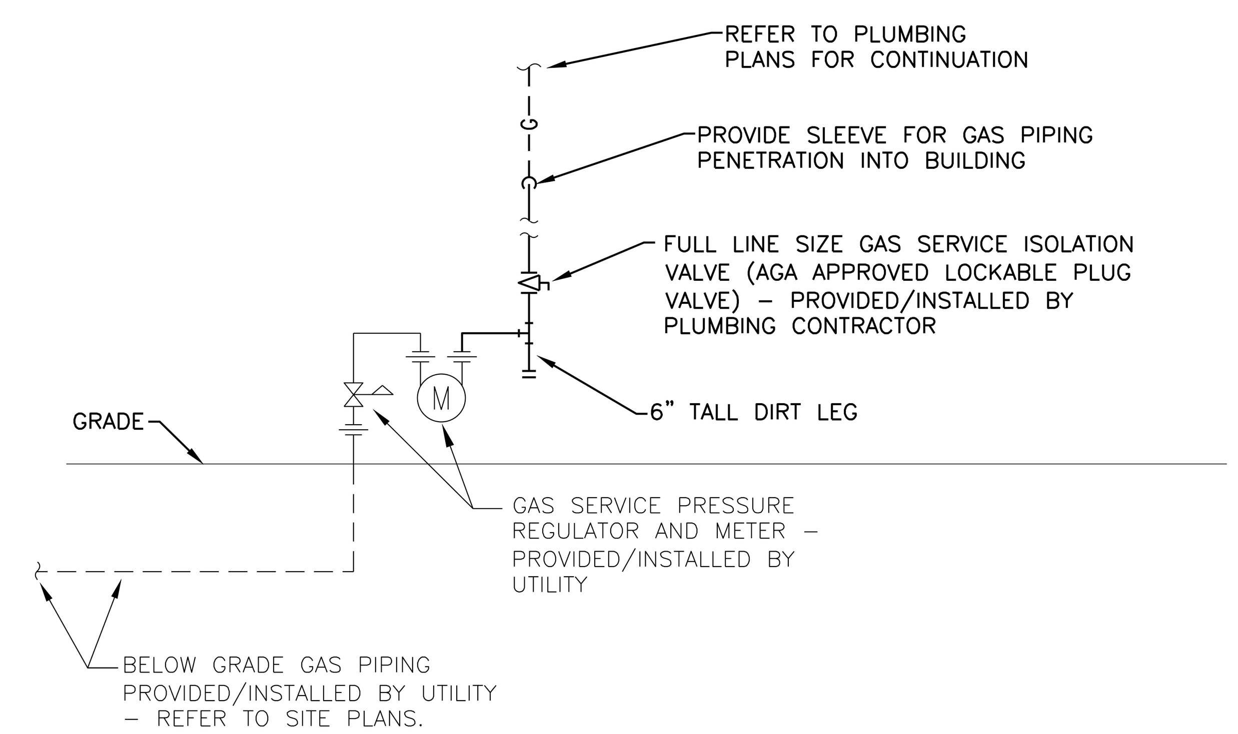
MARK	MANUFACTURER SERIES NUMBER	DESCRIPTION			ACCESSORIES, FEATURES, AND NOTES
FLOOR DRAINS					
		CONSTRUCTION	GRATE	SIZE	
FD-1	ZURN #Z-415B NOTE #1	ASME A112.21.1M; LACQUERED CAST IRON TWO PIECE BODY	ADJUSTABLE, ROUND, NICKEL-BRONZE STRAINER (ZURN TYPE B)	LINE SIZE SHOWN ON PLANS (MINIMUM 3")	DOUBLE DRAINAGE FLANGE, WEEP HOLES, REVERSIBLE CLAMPING COLLAR, TRAP PRIMER CONNECTION, AND ADJUSTABLE ROUND NICKEL-BRONZE STRAINER. USE CLAMPING COLLAR ON FLOORS ABOVE GRADE. THIS IS A STANDARD FLOOR DRAIN USE IN TOILET ROOMS, JANITOR'S CLOSETS, SHOWERS, ETC.
FD-3	ZURN #Z-415E NOTE #1	ASME A112.21.1M; LACQUERED CAST IRON TWO PIECE BODY	ADJUSTABLE, ROUND, NICKEL-BRONZE STRAINER WITH 4" FUNNEL (ZURN TYPE E)	LINE SIZE SHOWN ON PLANS (MINIMUM 3")	DOUBLE DRAINAGE FLANGE, WEEP HOLES, REVERSIBLE CLAMPING COLLAR, TRAP PRIMER CONNECTION, AND ADJUSTABLE ROUND NICKEL-BRONZE STRAINER WITH REMOVABLE 4" DIA. FUNNEL. USE CLAMPING COLLAR ON FLOORS ABOVE GRADE. THIS IS A FUNNEL FLOOR DRAIN (FFD) USED TO ACCEPT INDIRECT WASTE.
FD-F	JR SMITH #2506T-H DRAIN WITH JR SMITH #3385 WATER SUPPLY CONTROL BOX NOTE #1	DUO CAST CAST IRON BODY AND FLANGE WITH ACID RESIST COATED INTERIOR, 3/8" TRAP PRIMER CONNECTION	LOOSE SET, WIDE BAR GRATE (18 SQ INCHES FREE AREA), ROUND, NICKEL-BRONZE WITH HINGED WIDE BAR GRATE	LINE SIZE SHOWN ON PLANS (MINIMUM 4")	THIS IS A FLUSHING TYPE FLOOR DRAIN. PROVIDE WATER SUPPLY CONTROL BOX (JR SMITH #3385) - TYPE 304 S.S. SURFACE MTD BOX WITH 1/2" CW/HW SUPPLIES (PROTECTED BY INTEGREAL ATMOSPHERIC VACUUM BREAKER) AND 1/2" TEMPERED WATER SUPPLY OUT BOTTOM.
INTERIOR HOSE BIBS					
		DESCRIPTION	INLET	OUTLET	
HB-2	WOODFORD "MODEL 22CC"	ANTI-SIPHON WALL FAUCET, WALL MOUNTED, DOUBLE SERVICE FAUCET, INTEGRAL VACUUM BREAKER	(2) - 1/2"	3/4" MALE HOSE THREAD	MIXING HOSE BIB FOR INTERIOR, NON-FREEZING AREAS.
HB-3	WOODFORD "MODEL VC22CC" OR EQUAL	ANTI-SIPHON WALL FAUCET, WALL MOUNTED, DOUBLE SERVICE FAUCET, INTEGRAL VACUUM BREAKER	(2) - 1/2"	3/4" MALE HOSE THREAD	MIXING HOSE BIB FOR INTERIOR, NON-FREEZING AREAS. VERTICAL MOUNTING ARRANGEMENT.
EXTERIOR WALL HYDRANTS					
		DESCRIPTION	INLET	OUTLET	
WH-1	WOODFORD MODEL "B65" OR EQUAL	ASSE 1019; FREEZE RESISTANT, SELF-DRAINING TYPE WITH INTEGRAL VACUUM BREAKER	3/4"	3/4" MALE HOSE THREAD	WITH CHROME PLATED LOCKABLE RECESSED BOX HOSE THREAD SPOUT, LOCKSHIELD AND REMOVABLE KEY

NOTES:
1. OR APPROVED EQUAL BY JR SMITH, JOSAM, WADE.

PLUMBING FIXTURE SCHEDULE

FIXTURE MARK	MANUFACTURER SERIES NUMBER	FIXTURE AND TRIM DESCRIPTION					ACCESSORIES, FEATURES, AND NOTES
WATER CLOSETS							
		BOWL TYPE	OUTLET	FLUSH VALVE	SEAT	CARRIER	
WC-1	KOHLER "WELLWORTH #K-3481-U" BARRIER FREE	FLOOR MOUNT ELONGATED - FLUSH TANK	BOTTOM	N/A	OLSONITE #95	N/A	WHITE COLOR. SEAT SHALL BE ANTIMICROBIAL PLASTIC OPEN-FRONT SEAT.
LAVATORIES							
		BOWL TYPE	FAUCET	SUPPLY PIPE	TRAP	TAIL-PIECE	
LAV-1	KOHLER "GREENWICH K-2032" BARRIER FREE	WHITE VITREOUS CHINA WALL HUNG W/ CONCEALED ARM SUPPORTS	ADA APPROVED CHROME PLATED	ANGLE SCREW-DRIVER STOPS	1-1/2" CHROME PLATED	1-1/2" CHROME PLATED ADA COMPLIANT	TRIM: SLOAN ELECTRONIC HAND WASHING FAUCET "ETF-600". PROVIDE WITH ETF-233 PLUG-IN TRANSFORMER, ETF-1029-A AERATOR, AND ETF-460-A GRID STRAINER.
SINKS							
		BOWL TYPE	FAUCET	SUPPLY PIPE	TRAP	TAIL-PIECE	
SK-1	ELKAY "LUSTERTONE" LR AD - 3321 BARRIER FREE	DOUBLE BOWL TYPE 304 S.S. COUNTER TOP MOUNT 33"x21"x6.5"	ADA APPROVED	ANGLE SCREW-DRIVER STOPS	(2) 1-1/2" ADJUSTABLE CHROME PLATED P-TRAPS	(2) 1-1/2" CHROME PLATED ADA COMPLIANT	ELKAY MODEL "LKE-4124-F" HIGH RISE SWING SPOUT, SINGLE LEVER CONCEALED MOUNT WITH SPRAY AND HOSE, AND (2) REMOVABLE STRAINERS.
SK-2	ELKAY "LUSTRONE" LR AD - 2219 BARRIER FREE	SINGLE BOWL TYPE 304 S.S. COUNTER TOP MOUNT 22"X22"X6.5"	ADA APPROVED	ANGLE SCREW-DRIVER STOPS	1-1/2" ADJUSTABLE CHROME PLATED P-TRAP	1-1/2" CHROME PLATED ADA COMPLIANT	ELKAY MODEL "LKD2423BH" HIGH RISE SWING SPOUT, TWO HANDLE DECK MOUNT WITH 4 INCH WRIST BLADE HANDLES, AND REMOVABLE STRAINER. PROVIDE INSIKERATOR PRO SS, 3/4 HP FOOD WASTE DISPOSER (120V/1ø/8.1 AMPS).
SK-3	ELKAY "LUSTRONE" LR - 2521 BARRIER FREE	SINGLE BOWL TYPE 304 S.S. COUNTER TOP MOUNT 25"X21"X8"	ADA APPROVED	ANGLE SCREW-DRIVER STOPS	1-1/2" ADJUSTABLE CHROME PLATED P-TRAP	1-1/2" CHROME PLATED	ELKAY MODEL "LKE-4124-F" HIGH RISE SWING SPOUT, SINGLE LEVER CONCEALED MOUNT WITH SPRAY AND HOSE, AND REMOVABLE STRAINER.
MOP SINKS AND SERVICE SINKS							
		BASIN TYPE	FAUCET	TRAP	CARRIER		ACCESSORIES
MS-1	FLORESTONE 96	TERRAZZO MOP BASIN - NEO ANGLE 24" x 24" x 12"H	CHROME PLATED BRASS EXPOSED WALL TYPE	3" TRAP	FLOOR MOUNTED CORNER TYPE		KOHLER FAUCET MODEL # K-8909, RIGID VACUUM BREAKER SPOUT, 3/4" HOSE THREAD OUTLET, PAIL HOOK AND WALL BRACE. INCLUDE 5' OF RUBBER HOSE, HOSE HOLDER, MOP HOLDER, AND VINYL WALL GUARDS.
ELECTRIC WATER COOLERS							
		CAPACITY	DRAIN	CONDENSER	FINISH	ELECTRICAL	
EWC-1	WALL MOUNTED TWO LEVEL ELKAY MODEL "EZSTL8C" BARRIER FREE	8.0 GPH	(2) - 1 1/4"	INTEGRAL	STAINLESS STEEL	4.0 FLA AT 115V/1ø	PROVIDE 50°F OUTLET WATER AT 80°F INLET AND 90°F ROOM TEMP. PROVIDE/INSTALL OPTIONAL APRON
SHOWERS							
		SHOWER TYPE	SHOWER VALVE		SHOWER HEAD/ SPRAY PACKAGE		
SHR-1	BRADLEY HN 200 "HN 200-6'-HD-VL/SR-SF-ST" GRAB BARS, SEAT, SHOWER CURTAIN BY OTHERS	STAINLESS STEEL RECESSED WALL MOUNTED SHOWER SUPPLY MODULE	PRESSURE BALANCED - ASSE 1016 CERTIFIED BRADLEY "EQUA-FLO HD"		DELUX SHOWERHEAD ADJUSTABLE SPRAY HEAD & HAND-HELD SHOWER SPRAY WITH 60" FLEXIBLE S.S. HOSE		ADA COMPLIANT PRE-ASSEMBLED WALL SHOWER UNIT W/ ASSE 1016 LISTED PRESSURE BALANCE SHOWER VALVE. PROVIDE FOLLOWING OPTIONS: DELUX SHOWERHEAD WITH BALL JOINT, STOPS ON SUPPLIES. GRAB BARS, SEAT, SHOWER CURTAIN BY OTHERS.
SHR-2	BRADLEY WS-1WCA-ADA "WS-1WCA-ADA-HD-SB-SL-ST"	STAINLESS STEEL INDIVIDUAL WALL MOUNTED SHOWER SUPPLY MODULE	PRESSURE BALANCED - ASSE 1016 CERTIFIED BRADLEY "EQUA-FLO HD"		HAND-HELD SHOWER SPRAY WITH 60" FLEXIBLE S.S. HOSE		ADA COMPLIANT PRE-ASSEMBLED WALL SHOWER UNIT W/ ASSE 1016 LISTED PRESSURE BALANCE SHOWER VALVE. PROVIDE FOLLOWING OPTIONS: 24" SLIDE BAR, SLOPED TOP

NOTES:
1. ALL PLUMBING FIXTURES, EQUIPMENT, TRIM AND FITTINGS SHALL COMPLY WITH LOCAL, STATE AND FEDERAL REGULATIONS AND CODES, INCLUDING, BUT NOT LIMITED TO, WATER AND ENERGY CONSERVATION CODES, ADA REQUIREMENTS.
2. REFER TO SPECIFICATIONS FOR OTHER APPROVED MANUFACTURERS OF FIXTURES AND TRIM.
3. PROVIDE/INSTALL POINT OF USE "ASSE 1070 LISTED" THERMOSTATIC MIXING VALVES ON SUPPLIES TO ALL ADA ACCESSIBLE LAVATORIES AND SINKS.
4. INSTALL "LAV-SHIELDS" ON WALL MOUNTED LAVS/SINKS TO COMPLETELY CONCEAL EXPOSED TRAPS, SUPPLIES, AND MIXING VALVES.
5. INSTALL "LAV GUARDS" ON DRAIN/SUPPLY PIPING BELOW COUNTER MOUNTED LAVS/SINKS TO COVER TRAPS, SUPPLIES, AND MIXING VALVES.
6. COORDINATE ALL FIXTURE FINISHES/COLORS WITH ARCHITECT PRIOR TO ORDERING.
7. FLUSH VALVE HANDLES ARE TO BE LOCATED ON OPEN SIDE OF BARRIER FREE WATER CLOSETS - REFER TO ARCHITECTURAL INTERIOR ELEVATIONS.



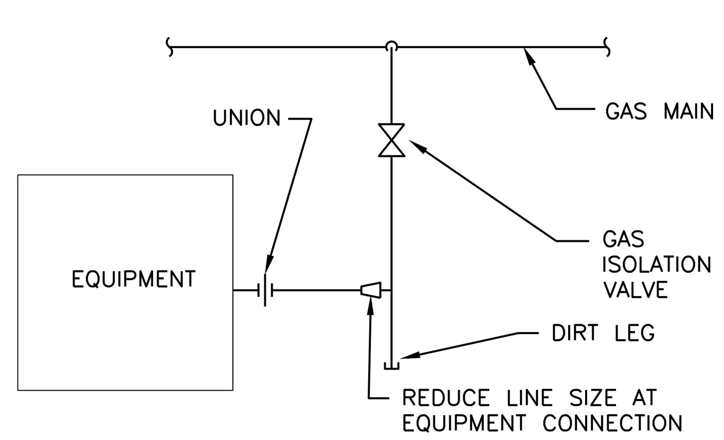
NOTES:
1. COORDINATE INSTALLATION OF GAS SERVICE WITH OWNER AND UTILITY - OWNER TO PAY FOR ALL GAS UTILITY CHARGES.
2. PROVIDE DIRT LEGS AND ISOLATION VALVES AT ALL EQUIPMENT CONNECTIONS.
3. MAINTAIN 3 FEET SEPARATION TO ALL DOORS, WINDOW, ELECTRICAL SERVICES.

NATURAL GAS SERVICE RISER DETAIL
NO SCALE

GAS LOAD SCHEDULE

UNIT I.D.	EQUIPMENT TYPE	INPUT BTU/HR	MAX INPUT PRESSURE IN W.C.	MIN INPUT PRESSURE IN W.C.	REMARKS
DWH-1	DOMESTIC WATER HEATER	125,000	11.0	5.0	
	DRYER	50,000	13.0	5.0	
FUR-1	FURNANCE	120,000	14.0	5.0	
FUR-2	FURNANCE	100,000	14.0	5.0	
FUR-3	FURNANCE	80,000	14.0	5.0	
UH-A	UNIT HEATER	60,000	14.0	5.0	
UH-B	UNIT HEATER	45,000	14.0	5.0	
UH-C	UNIT HEATER	45,000	14.0	5.0	
DF-K	DUCT FURNACE	125,000	14.0	5.0	
	FUTURE ADDITION	150,000	14.0	5.0	
	TOTAL	900,000	11.0	5.0	

NOTE:
1. COORDINATE INSTALLATION OF GAS SERVICE WITH OWNER AND UTILITY.



TYPICAL GAS CONNECTION AT EQUIPMENT PIPING DETAIL
NO SCALE

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DRAWING TITLE: PLUMBING DETAILS

PROJECT TITLE: PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY, GAYLORD, MICHIGAN

PROJECT NO.: 0160-10

DATE: APRIL 4, 2011

SHEET: P3

PLUMBING ABBREVIATION LIST

ABBREVIATION	DESCRIPTION
AAV	AIR ADMITTANCE VALVE
AFF	ABOVE FINISHED FLOOR
BFP	BACKFLOW PREVENTER
BHP	BRAKE HORSEPOWER
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNITS PER HOUR
CAP	CAPACITY
CI	CAST IRON
CO	CLEAN OUT
CORD.	COORDINATE
CW	DOMESTIC COLD WATER
DB	DRY BULB TEMPERATURE
DEG	DEGREES
DF	DRINKING FOUNTAIN
DN	DOWN
DWH	DOMESTIC WATER HEATER
DW&V	DRAINAGE WASTE & VENT
E.C.	ELECTRICAL CONTRACTOR
ELEV	ELEVATION
ELECT	ELECTRICAL
ESH	EMERGENCY SHOWER
EW	EMERGENCY EYE WASH
EWC	ELECTRIC WATER COOLER
EWT	ENTERING WATER TEMPERATURE
F	FIRE PROTECTION LINE
FD	FLOOR DRAIN
FLA	FULL LOAD AMPS
FLR	FLOOR
FFD	FUNNEL FLOOR DRAIN
FS	FLOOR SINK
FT	FEET
G	NATURAL GAS
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
HB	HOSE BIB
HP	HORSEPOWER
HR	HOUR
HTG	HEATING
HW	DOMESTIC HOT WATER
HWR	DOMESTIC HOT WATER RETURN
HYD	HYDRANT
HZ	HERTZ
I.E.	INVERT ELEVATION
IN	INCHES
IW	INDIRECT WASTE
KW	KILOWATT
LAV	LAVATORY
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MBH	THOUSAND BRITISH THERMAL UNITS PER HOUR
M.C.	MECHANICAL CONTRACTOR
MECH	MECHANICAL
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MS	MOP SINK
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NOM	NOMINAL
ORC	OVERFLOW ROOF DRAIN CONDUCTOR
P.C.	PLUMBING CONTRACTOR
PD	PRESSURE DROP (FEET OF WATER)
PRV	PRESSURE REDUCING VALVE
PSIA	POUNDS PER SQUARE INCH – ABSOLUTE
PSIG	POUNDS PER SQUARE INCH – GAUGE
NPCW	NON POTABLE WATER
RC	ROOF DRAIN CONDUCTOR
RPM	REVOLUTIONS PER MINUTE
RD	ROOF DRAIN
SAN	SANITARY WASTE
SHR	SHOWER
SK	SINK
SPHD	SPRINKLER HEAD
SPKR	SPRINKLER
SqFt	SQUARE FOOT/SQUARE FEET
SS	SERVICE SINK
S.S.	STAINLESS STEEL
ST	STORM DRAIN
TC	TEMPERATURE CONTROL
TD	TRENCH DRAIN
TYP	TYPICAL
UL	UNDERWRITERS LABORATORY
UON	UNLESS OTHERWISE NOTED
UR	URINAL
U/G	UNDERGROUND (BELOW GRADE)
V	VENT
VSD	VARIABLE SPEED DRIVE
VTR	VENT THRU ROOF
W	WASTE
W&V	WASTE AND VENT
WC	WATER CLOSET
WCO	WALL CLEAN OUT
WG	WATER GAUGE
WH	WALL HYDRANT

PLUMBING SYMBOL LIST

SYMBOL	DESCRIPTION
	PIPE ELBOW UP
	PIPE ELBOW DOWN
	DIRECTION OF FLOW
	UNION
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER
	PIPE CAP OR PLUG
	CIRCULATING PUMP
	ISOLATION VALVE
	GLOBE VALVE
	BALL VALVE
	CHECK VALVE (SWING)
	CHECK VALVE (SPRING)
	COMBINATION BALANCE VALVE & FLOW MEASURING DEVICE
	STRAINER (Y-TYPE)
	STRAINER (BLOW OFF TYPE)
	TRAP (PLAN VIEW)
	FLOOR DRAIN (PLAN VIEW)
	FLOOR DRAIN (ELEVATION)
FFD	FUNNEL FLOOR DRAIN (PLAN VIEW)
	FUNNEL FLOOR DRAIN (ELEVATION)
	ROOF DRAIN SUMP
CO	CLEAN OUT (IN FLOOR)
CO	CLEAN OUT (IN LINE)
BFP	BACKFLOW PREVENTER
HB	HOSE BIBB
WH	WALL HYDRANT
	PRESSURE RELIEF VALVE
	PRESSURE REDUCING VALVE
	PRESSURE AND TEMPERATURE RELIEF VALVE
	PRESSURE REGULATING VALVE
P/T	PRESSURE AND TEMPERATURE TEST PLUG
	PRESSURE GAUGE AND COCK
	THERMOMETER

SYMBOL	DESCRIPTION
CW	DOMESTIC COLD WATER PIPING
HW	DOMESTIC HOT WATER PIPING
HWR	DOMESTIC HOT WATER RETURN PIPING
TW	DOMESTIC TEMPERED DOMESTIC HOT WATER PIPING
SAN	SANITARY WASTE PIPING
ST	STORM SEWER PIPING
RC	RAIN CONDUCTOR PIPING
	SANITARY VENT PIPING
G	GAS PIPING (NATURAL GAS OR PROPANE)
NPCW	NON POTABLE COLD WATER
F	FIRE PROTECTION PIPING
A	COMPRESSED AIR PIPING

PLUMBING DRAWING INDEX

P1 PLUMBING PLAN – BELOW GRADE

P2 PLUMBING PLAN – ABOVE GRADE

P3 PLUMBING DETAILS

P4 PLUMBING DETAILS

METHODS OF NOTATION

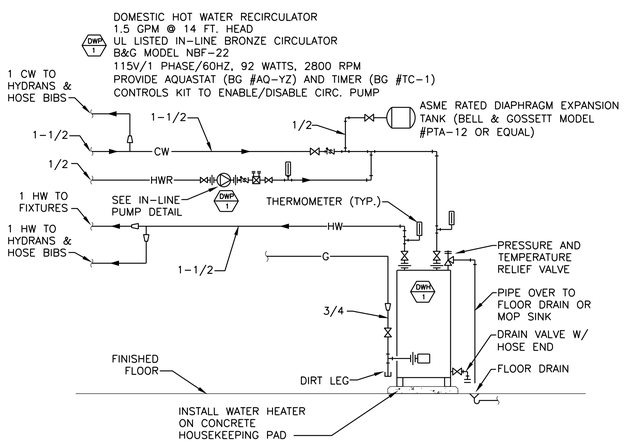
DWH 1 — EQUIPMENT DESIGNATION, (I.E. DOMESTIC WATER HEATER – 1)

1 — CONSTRUCTION KEY NOTE NUMBER

GAS FIRED DOMESTIC WATER HEATER SCHEDULE

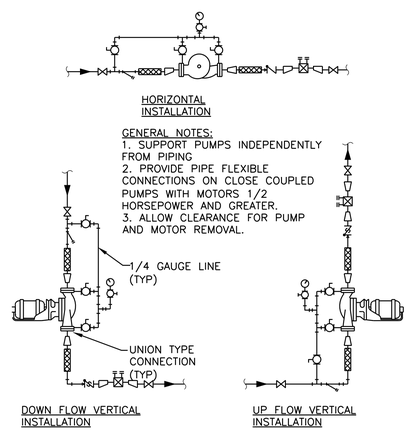
UNIT I.D.	STORAGE CAPACITY GALLONS	FUEL TYPE	FIRING RATE M.B.H.	RECOVERY G.P.H.	E.W.T °F	L.W.T. °F	ELECTRICAL		WEIGHT LBS (DRY)	MODEL NO.	REMARKS
							VOLTAGE	FLA			
DWH-1	60	NAT. GAS	125	144	40	140	115	5	570	LOCHINVAR #TNR125-60	

NOTES:
1. MODEL NUMBERS ARE LOCHINVAR. BRADFORD WHITE AND A.O. SMITH MAY BE BID AS EQUAL.
2. PROVIDE CONCENTRIC ROOF VENT KIT AND INSTALL SEALED COMBUSTION VENTING PER UP THRU ROOF PER MANUFACTURER'S RECOMMENDATIONS.



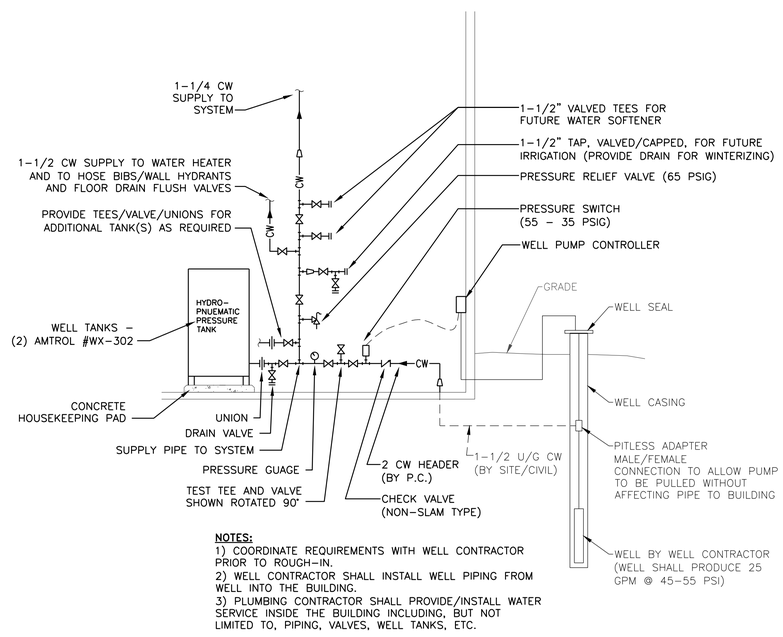
GAS FIRED DOMESTIC HOT WATER HEATER PIPING DIAGRAM

NO SCALE
(TYPICAL FOR DWH-1)



IN-LINE CIRCULATING PUMP DETAIL

NO SCALE
(TYPICAL FOR DWH-1 RECIRCULATION PUMP)



NOTES:
1) COORDINATE REQUIREMENTS WITH WELL CONTRACTOR PRIOR TO ROUGH-IN.
2) WELL CONTRACTOR SHALL INSTALL WELL PIPING FROM WELL INTO THE BUILDING.
3) PLUMBING CONTRACTOR SHALL PROVIDE/INSTALL WATER SERVICE INSIDE THE BUILDING INCLUDING, BUT NOT LIMITED TO, PIPING, VALVES, WELL TANKS, ETC.

DOMESTIC WATER WELL SYSTEM DETAIL & PIPING DIAGRAM

NO SCALE

JLK Engineering Project Number: AEA1103-01

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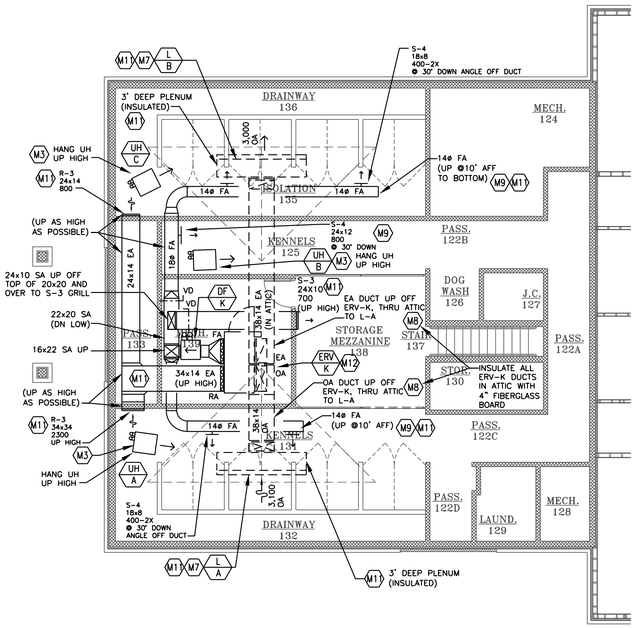
DRAWING TITLE: PLUMBING DETAILS

PROJECT TITLE: PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY, GAYLORD, MICHIGAN

PROJECT NO. 0160-10

DATE APRIL 4, 2011

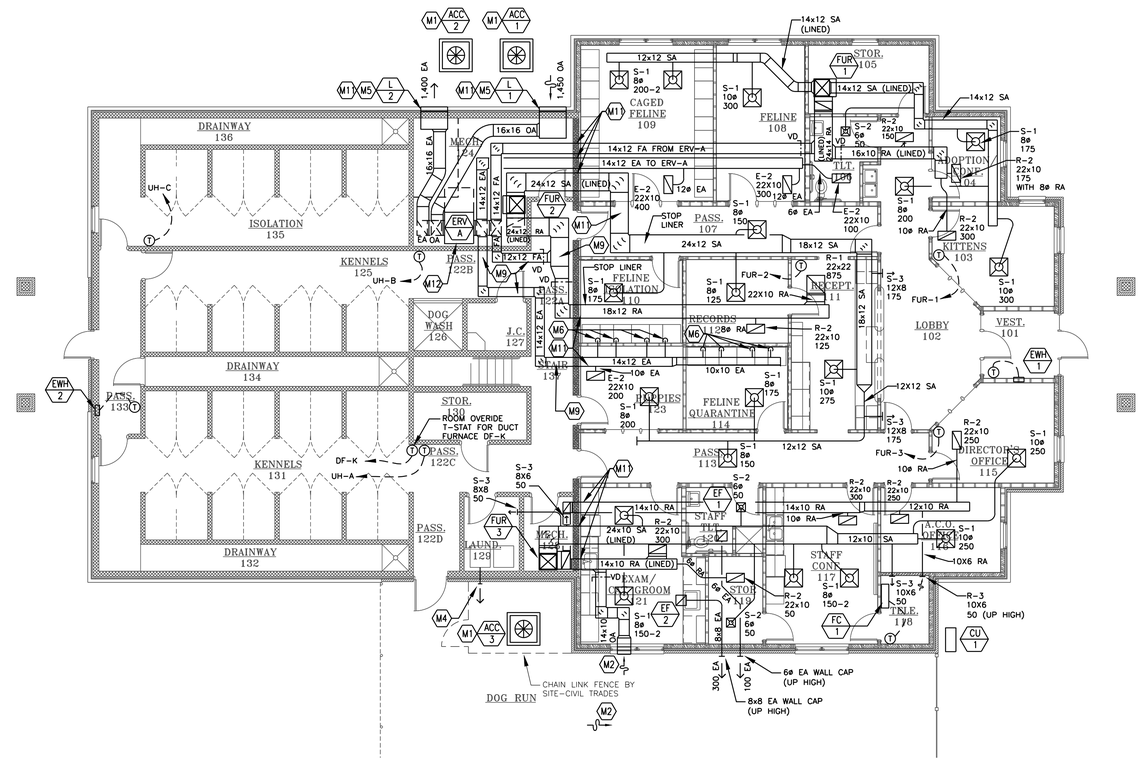
SHEET P4



NORTH

HVAC PLAN – MEZZANINE

SCALE: 1/8" = 1'-0"



NORTH

HVAC PLAN – GROUND FLOOR

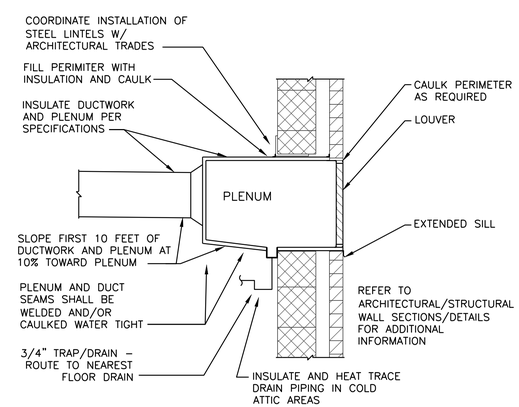
SCALE: 1/8" = 1'-0"

LOUVER SCHEDULE													
UNIT I.D.	SYSTEM SERVED	AIRFLOW RATE (CFM)	TYPE	FREE AREA SQ.FT.	FACE VELOCITY (FPM)	PRESSURE DROP (IN.WC.)	OVERALL WIDTH (INCHES)	OVERALL HEIGHT (INCHES)	OVERALL DEPTH (INCHES)	CONSTRUCTION	COLOR	MODEL NO.	REMARKS
L-1	ERV-A INTAKE AIR	1,450	INTAKE	3.5	415	0.04	36	32	6	ALUMINUM DRAINABLE BLADE	NOTE 2	ESD-603	SEE NOTES 1, 2, 3
L-2	ERV-A RELIEF AIR	1,400	RELIEF	3.5	400	0.04	36	32	6	ALUMINUM DRAINABLE BLADE	NOTE 2	ESD-603	SEE NOTES 1, 2, 3
L-A	ERV-K INTAKE AIR	3,100	INTAKE	6.75	459	0.04	CUSTOM	CUSTOM	6	ALUMINUM – DUAL DRAINABLE	NOTE 2	EDD-603	SEE NOTES 1, 2, 3, 4
L-B	ERV-K RELIEF AIR	3,000	RELIEF	6.75	444	0.05	CUSTOM	CUSTOM	6	ALUMINUM – DUAL DRAINABLE	NOTE 2	EDD-603	SEE NOTES 1, 2, 3, 4

NOTES:
1. MODEL NUMBERS ARE GREENHECK. RUSKIN MAY BE BID AS EQUAL.
2. LOUVERS SHALL HAVE A ACROFLUR COATING WITH 50% KYNAR OR HYLAR IN ITS RESIN SYSTEM WITH A 5 YEAR ADHESION WARRANTY AND 5 YEAR CHALKING/FADING WARRANTY. COORDINATE COLOR WITH ARCHITECT PRIOR TO ORDERING.
3. PROVIDE WITH THE FOLLOWING OPTIONS: EXTENDED SILL, ALUMINUM BIRDSCREEN, CLIP ANGLES.
4. LOUVERS L-A & L-B ARE CUSTOM TRIANGLE SHAPED – REFER TO ARCHITECTURAL ELEVATIONS/SECTIONS FOR EXACT DIMENSIONS.

DUCTLESS SPLIT HEAT PUMP UNIT SCHEDULE (R-410A)																	
FAN COIL UNIT ID	COOLING (BTU/HR)	HEATING (BTU/HR) @ 17°F	SOUND dB (A)	INDOOR FAN COIL UNIT						OUTDOOR CONDENSING SECTION							REMARKS
				AIRFLOW CFM	VOLTS/ PHASE	FAN UNIT MCA	FAN UNIT MAX FUSE	MODEL NO.	WEIGHT LBS	UNIT I.D.	VOLTS	PHASE	UNIT MCA	MAX FUSE	MODEL NO.	WEIGHT LBS	
FC-1	12,000	8,800	45	400	230/1	1 A	15 A	MSZ-GE12NA	22	CU-1	208/230	1	12 A	15 A	MUZ-GE12NA	80	SEE NOTES BELOW

NOTES:
1. MODEL NUMBERS ARE MITSUBISHI "MR. SLIM". FUJITSU AND DAIKEN MAY BE BID AS EQUAL. OTHER UNITS AND/OR OTHER MANUFACTURES MAY ONLY BE BID AS VOLUNTARY ALTERNATES.
2. PROVIDE/INSTALL REFRIGERANT LINES TO/FROM INDOOR FAN COIL TO WALL MOUNTED CONDENSING UNIT.
3. CONTRACTOR SHALL MOUNT CONDENSING UNIT UP OFF GROUND ON OPTIONAL FIBERGLASS PAD (MITSUBISHI #ULTRALITE) WITH CLEARANCES AS REQUIRED FOR AIRFLOW AND MAINTENANCE.
4. TRAP/DRAIN CONDENSATE FROM FAN COIL UNIT TO SANITARY SYSTEM.
5. PROVIDE OPTIONAL WALL MOUNTED/HARDWIRED PROGRAMMABLE T-STAT.
6. PROVIDE OPTIONAL 3-POLE DISCONNECT (#TAZ-MS303) FOR INDOOR FAN COIL.



OUTDOOR AIR INTAKE / RELIEF AIR LOUVER & PLENUM DETAIL

NO SCALE

KEYED CONSTRUCTION NOTES:

M1 MOUNT CONDENSING UNITS ON PRE-FORMED, REINFORCED FIBERGLASS PADS.

M2 PROVIDE 18" WIDE X 8" HIGH HOODED WALL CAP (GREENHECK MODEL WC-18X8). REMOVE BUILT-IN BACKDRAFT DAMPER, INSTALL UP HIGH AT 9'6" AFF.

M3 ROUTE UNIT HEATER COMBUSTION AIR AND EXHAUST AIR VENT PIPING UP THROUGH ROOF TO CONCENTRIC ROOF KIT PER MANUFACTURER RECOMMENDATIONS. MAINTAIN 10' SEPARATION TO FRESH AIR INTAKE LOUVERS.

M4 VENT DRYER TO OUTDOORS PER CODE.

M5 INSTALL LOUVER AT 7'-4" AFF (TO TOP OF LOUVER). INSTALL 36" DEEP PLENUM ON LOUVER L-1, INSTALL 24" DEEP PLENUM ON LOUVER L-2. INSULATE PLENUMS PER SPECIFICATIONS. REFER TO LOUVER DETAIL. COORDINATE LOCATION WITH ARCHITECTURAL ELEVATIONS AND MASONRY TRADES.

M6 6"ø EA DUCT DOWN TO 4"ø CONNECTION ON CAT CONDO UNITS. INSTALL BALANCE DAMPER AT TAKE OFF FROM MAIN – BALANCE TO 25 CFM PER CONDO (50 CFM PER 4"ø DROP).

M7 CUSTOM TRIANGLE SHAPED LOUVER INSTALLED IN DORMER – REFER TO ARCHITECTURAL ELEVATIONS/SECTIONS FOR DETAILS ON SIZE/SHAPE OF LOUVER. INSTALL 36" DEEP PLENUM ON LOUVER (INSULATED PER SPECS). REFER TO LOUVER DETAIL. COORDINATE INSTALLATION WITH ROOF TRUSS LAYOUT DURING ROOF TRUSS SHOP DRAWING REVIEW PHASE.

M8 INSTALL 38x14 DUCTS TO/FROM ERV-K AND LOUVERS. ROUTE DUCTS (INSULATED PER SPECS) UP FROM MECH. MEZZANINE INTO ATTIC (NOTE: DUCTS DASHED ARE IN ATTIC) AND THRU ATTIC (IN-BETWEEN/AROUND TRUSSES. REFER TO ARCHITECTURAL SECTIONS – IF OTHER DUCT SIZES ARE NEEDED MAINTAIN 530 SQUARE INCH FREE AREA) TO LOUVERS/PLENUMS. INSTALL 30" BELL MOUTH TRANSITION ON EACH DUCT AT CONNECTION TO PLENUM.

M9 ALL EXPOSED DUCTWORK IN KENNEL AREAS SHALL BE PVC COATED DUCTWORK AND INSULATED PER SPECS (EXCEPT EXPOSED FRESH AIR (FA) SUPPLY DUCTWORK FROM ERV-K WHICH DOES NOT REQUIRE INSULATION).

M10 LINE 14X10 FA DUCT FROM ERV-A TO FUR-2 RA DUCT.

M11 COORDINATE SIZE/LOCATION OF ALL DUCT/PIPE PENETRATIONS THRU LOAD BEARING WALLS/FLOORS/MEMBERS WITH STRUCTURAL TRADES FOR LINTELS, BEAMS, ETC. PRIOR TO ROUGH-IN.

M12 ERVs ARE 40" WIDE PLUS DISCONNECTS – REMOVE DISCONNECT SWITCH AND LOCATE ERVs IN MECH 124 AND MECH 139 BEFORE INSTALLING DOOR JAMBS. REINSTALL DISCONNECT SWITCH ON ERVS PER MFR WIRING DIAGRAMS.

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DRAWING TITLE: MECHANICAL - HVAC PLAN

PROJECT TITLE: PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY, GAYLORD, MICHIGAN

PROJECT NO. 0160-10

DATE APRIL 4, 2011

SHEET M1

RECESSED ELECTRIC WALL HEATER SCHEDULE

UNIT I.D.	CAPACITY MBH	AIRFLOW CFM	ELECTRICAL			MODEL NO.	REMARKS
			VOLTS	PHASE	KW		
EWH-1	6,826	245	240	1	2	3450 SERIES	SEE NOTES
EWH-2	10,239	245	240	1	3	3450 SERIES	SEE NOTES

NOTES:
1. MODEL NUMBERS ARE MARKEL UNLESS OTHERWISE NOTED. Q-MARK MAY BE BID AS EQUAL.
2. INSTALL FULLY RECESSED OR SEMI-RECESSED IN WALL.
3. WALL HEATER SHALL HAVE COATED 16 GAUGE STEEL TAMPERPROOF GRILL.
4. PROVIDE CIRCUIT BREAKER DISCONNECT.
5. HEATER SHALL HAVE BUILT-IN CONTACTOR WITH 24V COIL AND HEATER VOLTAGE/24V TRANSFORMER. CONNECT TO WALL MOUNTED 24V T-STAT. INSTALL T-STAT IN CLEAR/PLASTIC/LOCKABLE T-STAT GUARD.

VARIABLE SPEED, 2-STAGE, CONDENSING FORCED AIR FURNACE WITH A/C CONDENSING UNIT SCHEDULE

UNIT NO.	TYPE	FUEL TYPE	CAPACITY			AIR HANDLING				ELECTRICAL			AIR COOLED CONDENSING UNIT (R-410 A)								MODEL NO.	REMARKS
			HEATING INPUT BTUH	HEATING OUTPUT BTUH	COOLING OUTPUT BTUH	AIR FLOW CFM	STATIC PRESSURE IN. WG.	MINIMUM OA CFM	WEIGHT (LBS)	VOLTAGE PHASE	MINIMUM CIRCUIT AMPS	MAXIMUM FUSE SIZE	UNIT NO.	COOLING OUTPUT BTUH	SEER	AMBIENT AIR TEMP °F	POWER INPUT MCA	VOLTAGE/ PHASE	MAX FUSE AMPS	WEIGHT (LBS)	LOW AMBIENT		
FUR-1	UPFLOW	NAT GAS	120,000	114,700	48,000	1,600	0.7	800	250	115/1	15	20	ACC-1	48,000	15	95	30	230/1	50	300	30°F	TUH2D120A9V5VA FURNACE WITH 4TTX50 CONDENSER	SEE NOTES
FUR-2	UPFLOW	NAT GAS	100,000	95,000	48,000	1,600	0.7	600	250	115/1	14	20	ACC-2	48,000	15	95	30	230/1	50	300	30°F	TUH2D100A9V4VA FURNACE WITH 4TTX50 CONDENSER	SEE NOTES
FUR-3	UPFLOW	NAT GAS	80,000	76,000	30,000	1,350	0.7	400	170	115/1	11	15	ACC-3	36,000	15	95	22	230/1	35	260	30°F	TUH2B080A9V3VA FURNACE WITH 4TTX50 CONDENSER	SEE NOTES

NOTES:
1. ALL MODEL NUMBERS ARE TRANE OR EQUAL BY CARRIER, YORK, BRYANT.
2. PROVIDE MEDIA AIR CLEANER FILTER RACK WITH MINIMUM MERV 8 FILTERS. PROVIDE ONE (1) EXTRA SET OF FILTERS FOR EACH FURNACE. INSTALL TURNING VANES IN INLET DUCT ELBOW TO MEDIA FILTER CASING. INSTALL RETURN AIR PLENUM BELOW FURNACE WHERE NEEDED ON 5-TON UNITS.
3. PROVIDE BY-PASS FLOW THROUGH HUMIDIFIER FOR EACH FURNACE. HONEYWELL MODEL HE 265B WITH HUMIDITY CONTROLS (OR EQUAL).
4. PROVIDE CASED DX COOLING COIL. TRAP/DRAIN TO FLOOR DRAIN OR PUMP UP TO SANITARY LINE.
5. ROUTE PVC COMBUSTION AIR PIPES TO CONCENTRIC VENT KIT UP THRU ROOF. INSTALL VENTING IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
6. PROVIDE SEVEN DAY PROGRAMMABLE NIGHT SETBACK ZONE T-STATS WITH HEAT/COOL/FAN/AUTO/ON. PROVIDE CLEAR PLASTIC, LOCKABLE T-STAT ENCLOSURE. M.C. SHALL PROVIDE/INSTALL ALL LOW VOLTAGE CONTROL WIRING.
7. PROVIDE/INSTALL THE FOLLOWING ACCESSORIES FOR THE AIR COOLED CONDENSERS: ANTI-SHORT CYCLE TIMER, LOW AMBIENT, EVAPORATOR DEFROST CONTROL, CRANK CASE HEATER KIT, REFRIGERANT LINESETS (PROVIDE/INSTALL REFRIGERANT LINESETS TO FROM CONDENSING UNITS LOCATED ON GRADE, REINFORCED FIBERGLASS CONDENSER MOUNTING PADS.
8. CONTRACTOR SHALL PROVIDE/INSTALL VENTING PER MFR RECOMMENDATIONS AND CODE REQUIREMENTS.

GRILLE, REGISTER, AND DIFFUSER SCHEDULE

UNIT I.D.	FACE SIZE	NECK SIZE	FRAME TYPE	ACCESSORY	CONSTRUCTION	FINISH	MODEL NO.	REMARKS
S-1	24x24	SEE PLANS	T-BAR FLUSH NOTE 2	-	STEEL	WHITE	TMS	SQUARE CEILING DIFFUSER
S-2	12x12	SEE PLANS	T-BAR FLUSH NOTE 2	-	STEEL	WHITE	TMS	SQUARE CEILING DIFFUSER
S-3	NECK SIZE + 1-3/4"	SEE PLANS	EXPOSED SCREW	OPPOSED DAMPER	STEEL	WHITE	300RS	SUPPLY GRILL DOUBLE DEFLECTION - 3/4" SPACING
S-4	NECK SIZE + 1-1/2"	SEE PLANS	SPIRAL DUCT DIRECT MOUNT	INTEGRAL EXTRACTOR	ALUMINUM	WHITE	S300FS	DIRECT SPIRAL DUCT-MOUNTED GRILLS DOUBLE DEFLECTION W/ RADIUS END
S-5	-	SEE PLANS	-	-	STEEL	WHITE	TMR	ROUND CEILING DIFFUSER
R-1	24x24	22x22	T-BAR FLUSH NOTE 2	-	STEEL	WHITE	PAR	24"x24" PERFORATED RETURN GRILL
R-2	24x12	22x10	T-BAR FLUSH NOTE 2	-	STEEL	WHITE	PAR	24"x12" PERFORATED RETURN GRILL
R-3	NECK SIZE + 1-3/4"	SEE PLANS	EXPOSED SCREW	-	STEEL	WHITE	355 RL	RETURN GRILL FIXED 45° DEFLECTION - 1/2" SPACING
R-4	NECK SIZE + 2-1/2"	SEE PLANS	SURFACE MOUNT	OPPOSED DAMPER	ALUMINUM	WHITE	50F	EGG CRATE FACE RETURN 1/2" x 1/2" x 1/2" AL GRID CORE
E-1	24x24	22x22	T-BAR FLUSH NOTE 2	-	STEEL	WHITE	PAR	24"x24" PERFORATED RETURN GRILL
E-2	24x12	22x10	T-BAR FLUSH NOTE 2	-	STEEL	WHITE	PAR	24"x12" PERFORATED RETURN GRILL
E-3	NECK SIZE + 1-3/4"	SEE PLANS	EXPOSED SCREW	-	STEEL	WHITE	355 RL	RETURN GRILL FIXED 45° DEFLECTION - 1/2" SPACING

NOTES:
1. MODEL NUMBERS ARE TITUS UNLESS OTHERWISE NOTED. PRICE, NAILOR, CARNES, KRUEGER, TUTLE & BAILEY MAY BE BID AS EQUALS.
2. WHERE LOCATED IN GYPSUM BOARD OR SIMILAR HARD CEILING, PROVIDE TITUS MODEL TRM RAPID MOUNT FRAME TO CREATE LAY-IN FUNCTION. COORDINATE WITH ARCHITECTURAL REFLECTED CEILING PLANS FOR CEILING TYPE AT EACH LOCATION (LAY-IN CEILING VS. HARD CEILING).
3. COORDINATE COLOR OF GRILLES, REGISTERS, DIFFUSERS WITH OWNER/ARCHITECT PRIOR TO ORDER.

FAN SCHEDULE

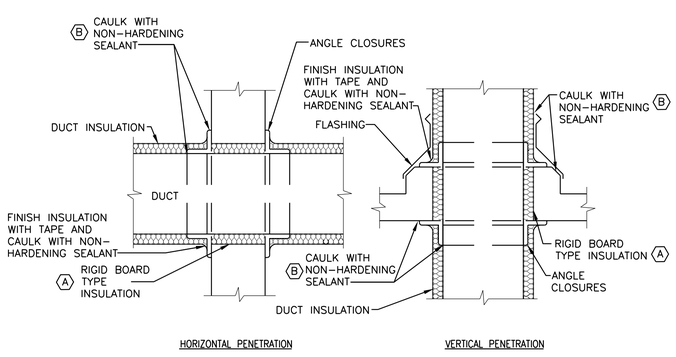
UNIT I.D.	SYSTEM SERVED	TYPE	AIRFLOW CFM	E.S.P. IN. W.G.	RPM	MOTOR				ELECTRICAL		CURB HEIGHT (IN)	WEIGHT LBS	MODEL NO.	REMARKS
						BHP	HP	RPM	DRIVE	VOLTS	PHASE				
EF-1	STAFF TOILET	CEILING MOUNTED EXHAUST	100	0.25	1,072	0.01	53W	1,100	DIRECT	115	1	-	15	SP-A125	SEE NOTES 1, 2
EF-2	EXAM/GROOM	CEILING MOUNTED EXHAUST	350	0.25	1,294	0.01	135W	1,350	DIRECT	115	1	-	21	SP-A390	SEE NOTES 1, 3

NOTES:
1. MODEL NUMBERS ARE GREENHECK UNLESS OTHERWISE NOTED. COOK AND PENN MAY BE BID AS EQUAL.
2. PROVIDE THE FOLLOWING OPTIONS/ACCESSORIES: SOLID STATE SPEED CONTROL (MOUNTED AND WIRED EXTERNALLY), MOTOR W/ THERMAL OVERLOADS, CSA LABELED MOTOR, UL-507 - "ELECTRIC FANS", HOODED WALL CAP - ROUND CONNECTION (MODEL WC-6), ALUMINUM GRILLE W/ WHITE ENAMEL FINISH (MODEL MG-210), ROUND DUCT CONNECTOR (MODEL RDC-6), ISOLATION KIT, CLASS B MOTOR INSULATION OR GREATER.
3. PROVIDE THE FOLLOWING OPTIONS/ACCESSORIES: ALUMINUM GRILLE W/ WHITE ENAMEL FINISH, MOTOR W/ THERMAL OVERLOADS, CLASS B MOTOR INSULATION OR GREATER, UL-507 - "ELECTRIC FANS", CSA LABELED MOTOR, SOLID STATE SPEED CONTROL (MOUNTED AND WIRED EXTERNALLY), HOODED WALL CAP - SQUARE CONNECTION (WC-8X8), ISOLATION KIT.

SEPARATED COMBUSTION GAS FIRED UNIT HEATER SCHEDULE

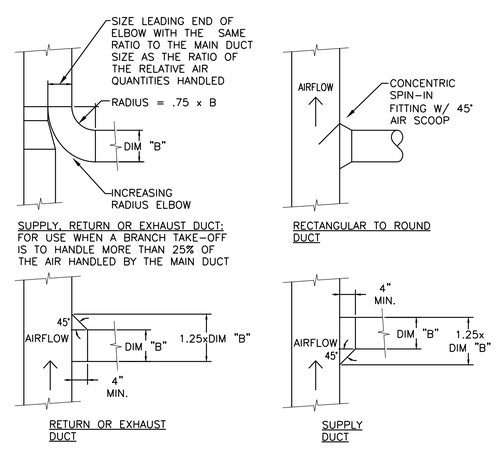
UNIT I.D.	GAS TYPE	CAPACITY INPUT MBH	CAPACITY OUTPUT MBH	AIRFLOW CFM	AIR TEMP RISE ° F	FAN			ELECTRICAL			FLUE SIZES INCHES	WEIGHT LBS	MODEL NO.	REMARKS
						TYPE	HP	RPM	VOLTS	PHASE	FLA				
UH-A	NATURAL	60	50	770	60	PROPELLER	0.06	1,550	115	1	3	2 @ 4"	75	UDAS 75	SEE NOTES
UH-B	NATURAL	45	37	630	55	PROPELLER	0.06	1,550	115	1	3	2 @ 4"	75	UDAS 75	SEE NOTES
UH-C	NATURAL	45	37	630	55	PROPELLER	0.06	1,550	115	1	3	2 @ 4"	75	UDAS 75	SEE NOTES

NOTES:
1. MODEL NUMBERS ARE MODINE UNLESS OTHERWISE NOTED. STERLING, REZNOR MAY ONLY BE BID AS ALTERNATES.
2. PROVIDE THE FOLLOWING STANDARD FEATURES: SEPARATED COMBUSTION SYSTEM, BUILT-IN ELECTRICAL DISCONNECT SWITCH, FULL FAN GUARD (OSHA APPROVED), TRANSFORMER FOR 24V T-STAT CONTROLS.
3. PROVIDE THE FOLLOWING OPTIONAL FEATURES (FACTORY INSTALLED): TWO-STAGE GAS VALVE, 409 STAINLESS STEEL HEAT EXCHANGER, TOTAL ENCLOSED FAN MOTOR.
4. PROVIDE THE FOLLOWING ACCESSORIES FOR FIELD INSTALLATION: VERTICAL COMBUSTION AIR/VENT KIT INCLUDING CONCENTRIC ADAPTER, 24V T-STAT AND T-STAT GUARD WITH LOCKING COVER, DOWNTURN NOZZLE KIT (25°-65° RANGE), CEILING SUSPENSION KIT.
5. CONTRACTOR SHALL PROVIDE/INSTALL VENTING PER MFR RECOMMENDATIONS AND CODE REQUIREMENTS.

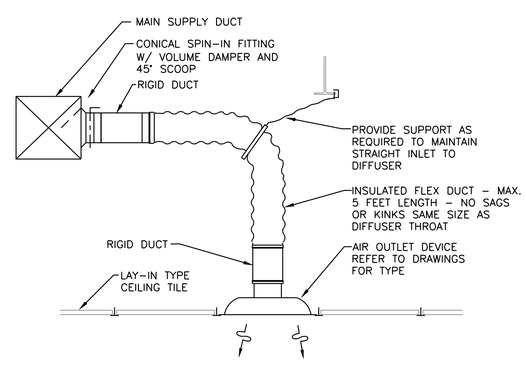


NOTE:
WHERE DUCTS PENETRATE A FIRE RATED ASSEMBLY, AND A FIRE DAMPER IS NOT REQUIRED, THE DUCT SHALL BE PROTECTED AS A THROUGH PENETRATION IN ACCORDANCE WITH BUILDING CODE REQUIREMENTS:
(A) REPLACE WITH CERAMIC FIBER OR MINERAL WOOL BATT INSULATION
(B) SEAL ALL AROUND OPENING WITH FIRE STOPPING MATERIAL SEALANT

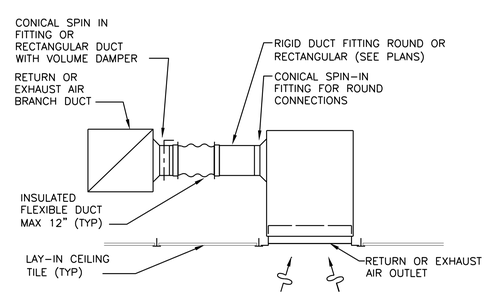
DUCT PENETRATION DETAIL (NON FIRE DAMPER PENETRATION)
NO SCALE



RECTANGULAR DUCT TAKE-OFF DETAILS
NO SCALE



SUPPLY AIR DIFFUSER DETAIL
NO SCALE



DUCTED RETURN OR EXHAUST AIR INLET DETAIL
NO SCALE

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DRAWING TITLE: MECHANICAL DETAILS

PROJECT TITLE: PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY, GAYLORD, MICHIGAN

PROJECT NO. 0160-10

DATE APRIL 4, 2011

SHEET M2

INDOOR, SEPERATED COMBUSTION, GAS-FIRED, DUCT FURNACE SCHEDULE

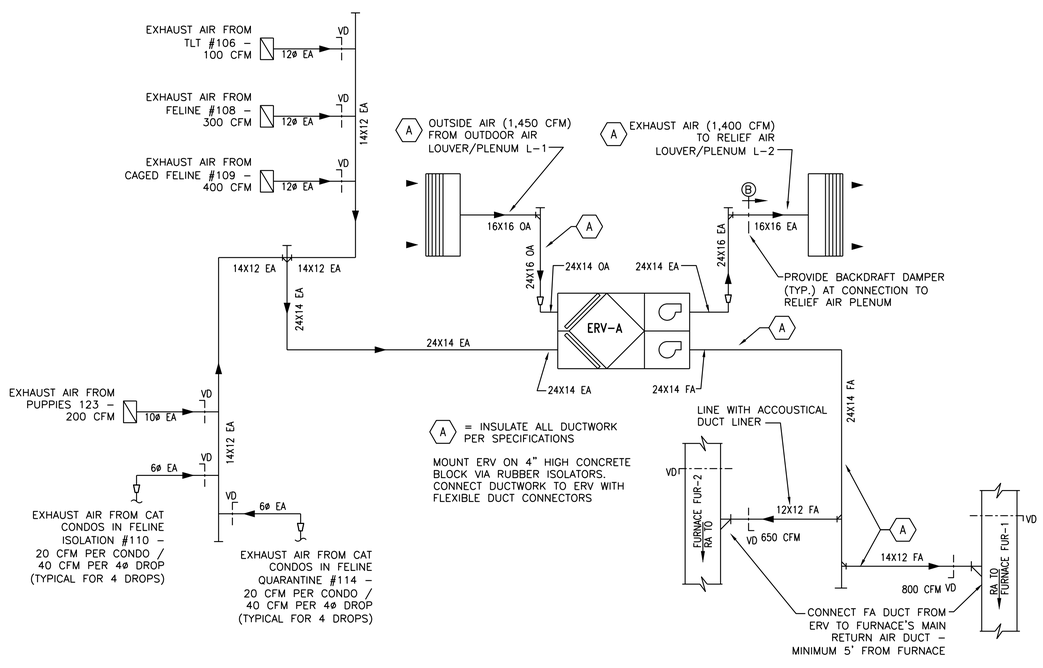
UNIT NO.	AIR FLOW CONFIG.	FUEL TYPE	HEATING CAPACITY		AIR HANDLING			DUCT CONNECTIONS		WEIGHT LBS	FLUE SIZE INCHES	ELECTRICAL		MODEL NO.	REMARKS
			HEATING INPUT BTUH	HEATING OUTPUT BTUH	AIR FLOW CFM	TEMP. RISE °F	PRESS. DROP IN WG	INLET HIGH x WIDE INCHES	OULET HIGH x WIDE INCHES			VOLT/ PHASE	AMPS (FLA)		
DF-K	HORIZONTAL	NAT. GAS	125,000	100,000	3,100	30	0.50	15 X 18	15 X 18	200	(2) - 6"	115/1	2	HSC-125	REFER TO NOTES BELOW

NOTE:
1. MODEL NUMBERS ARE REZNOR. MODINE MAY BE BID AS EQUAL.
2. PROVIDE THE FOLLOWING STANDARD FEATURES: 115V SUPPLY VOLTAGE; 24V CONTROL VOLTAGE TRANSFORMER; HIGH LIMIT SAFETY CUT-OUT; TERMINAL BLOCK WIRING; SIDE ACCESS FOR BURNERS AND CONTROLS (SLIDE OUT BURNER DRAWER); ADJUSTABLE FAN CONTROL.
3. PROVIDE THE FOLLOWING OPTIONAL FACTORY INSTALLED FEATURES: E-3 (409) STAINLESS STEEL HEAT EXCHANGER; E-3 STAINLESS STEEL BOTTOM DRIP PAN; E-3 STAINLESS STEEL BURNER; REZNOR "AG9" ELECTRONIC MODULATING (50%-100%) GAS CONTROL WITH DUCTSTAT AND REMOTE TEMPERATURE SELECTION AND ROOM OVERIDE T-STAT (REZNOR "CL9").
4. PROVIDE THE FOLLOWING OPTIONAL FIELD INSTALLED ACCESSORIES: CONDENSATE DRAIN FLANGE KIT; REMOTE TEMPERATURE SELECTION AND ROOM OVERIDE T-STAT (REZNOR "CL9"); FLOOR MOUNT LEGS; VERTICAL CONCENTRIC VENT TERMINAL/COMBUSTION AIR ASSEMBLY.
5. CONTRACTOR SHALL INSTALL ALL VENTING IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND CODE REQUIREMENTS.

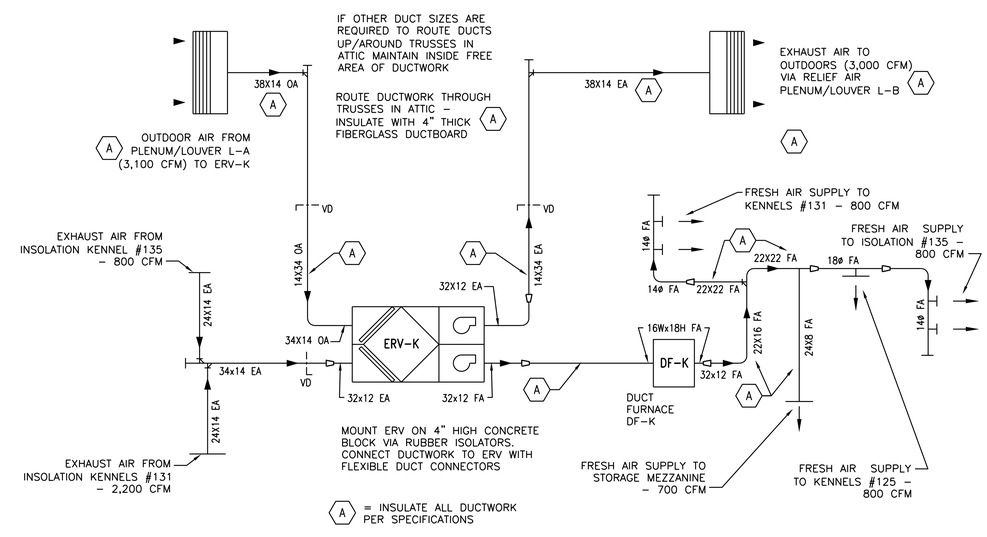
ERV SCHEDULE

UNIT I.D.	SYSTEM SERVED	AIRFLOW (CFM) OA/EA	E.S.P. IN. W.G.		WINTER EFFICIENCY %	ELECTRICAL			WEIGHT (LBS)	MODEL NO.	REMARKS
			OA	RM AIR		MCA	VOLTS	PHASE			
ERV-A	FUR-1 & FUR-2	1,450/1,400	1.0	0.50	63	26	240	1	400	HE2XINV-D15 K(2 HP) K(2 HP)-ANT-L (UL LISTED)	SEE NOTES 1, 2, 3, 4, 5
ERV-K	KENNEL AREA	3,100/3,000	0.75	0.50	67	31	240	1	850	HE4XINV-D15 L(3 HP) L(3 HP)-ANT-L (UL LISTED)	SEE NOTES 1, 2, 3, 4

NOTES:
1. MODEL NUMBERS ARE RENEWAIRE. BASE BID RENEWAIRE - OTHER MANUFACTURER'S MAY ONLY BE BID AS ALTERNATES.
2. SUPPLY ONE EXTRA SET OF FILTERS FOR OWNER'S USE.
3. PROVIDE FOLLOWING FACTORY INSTALLED OPTIONS: DOUBLE WALL CONSTRUCTION, NON-FUSED DISCONNECT SWITCH (NEMA 1 ENCLOSURE, UNIT MOUNTED/WIRED), (1) 24V CONTACTOR.
4. PROVIDE FOLLOWING CONTROLS OPTIONS: TRANSFORMER RELAY PACKAGE (RENEWAIRE #TR40); DIGITAL TIME CLOCK (RENWEAIRE #TC70-W).
5. ERV-A SHALL BE INTERLOCKED WITH BOTH FURNACES FUR-1 & FUR-2 SO THAT BOTH FUR-1 & FUR-2 SUPPLY FANS OPERATE WHENEVER ERV-A OPERATES.



ENERGY RECOVERY VENTILATOR SCHEMATIC DIAGRAM
NO SCALE
(TYPICAL FOR ERV-A)



ENERGY RECOVERY VENTILATOR SCHEMATIC DIAGRAM
NO SCALE
(TYPICAL FOR ERV-K)

JLK Engineering Project Number: AEA11103-01

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DRAWING TITLE: MECHANICAL DETAILS

PROJECT TITLE: PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY, GAYLORD, MICHIGAN

PROJECT NO.: 0160-10

DATE: APRIL 4, 2011

SHEET: M3

MECHANICAL ABBREVIATION LIST

ABBREVIATION	DESCRIPTION
A/C	AIR CONDITIONING
AFF	ABOVE FINISHED FLOOR
APD	AIR PRESSURE DROP
BFP	BACKFLOW PREVENTER
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNITS PER HOUR
C/C	CASED COOLING COIL
CFM	CUBIC FEET PER MINUTE
CO	CLEAN OUT
COND	CONDENSATE
CONT.	CONTINUATION OR CONTINUED
CORD.	COORDINATE
CP	CIRCULATING PUMP
CUH	CABINET UNIT HEATER
CW	DOMESTIC COLD WATER
DB	DRY BULB TEMPERATURE
DEG	DEGREES
DN	DOWN
DWH	DOMESTIC WATER HEATER
DW&V	DRAINAGE WASTE & VENT
EG	EXHAUST GRILLE OR REGISTER
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
E.C.	ELECTRICAL CONTRACTOR
EDB	ENTERING DRY BULB TEMPERATURE
EF	EXHAUST FAN
ELEV	ELEVATION
ELECT	ELECTRICAL
ESP	EXTERNAL STATIC PRESSURE
EWB	ENTERING WET BULB TEMPERATURE
EWB	ENTERING WATER TEMPERATURE
EXH	EXHAUST
F	FIRE PROTECTION
FA	FRESH AIR
FD	FLOOR DRAIN
F.DPR	FIRE DAMPER
FFD	FUNNEL FLOOR DRAIN
FLA	FULL LOAD AMPS
FLR	FLOOR
FPM	FEET PER MINUTE
FT	FEET
FS	FLOOR SINK
FUR	FURNACE

ABBREVIATION	DESCRIPTION
G	GAS (NATURAL GAS / PROPANE)
GPM	GALLONS PER MINUTE
HB	HOSE BIB
HP	HORSEPOWER
HR	HOUR
HTG	HEATING
HW	DOMESTIC HOT WATER
HWR	DOMESTIC HOT WATER RETURN
HZ	HERTZ
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IN	INCHES
ISP	INTERNAL STATIC PRESSURE
IW	INDIRECT WASTE
KW	KILOWATT
KVA	KILO-VOLT-AMPERE
LAV	LAVATORY
LAT	LEAVING AIR TEMPERATURE
LDB	LEAVING DRY BULB TEMPERATURE
LRA	LOCKED ROTOR AMPS
LWB	LEAVING WET BULB TEMPERATURE
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MA	MIXED AIR
MBH	THOUSAND BRITISH THERMAL UNITS PER HOUR
M.C.	MECHANICAL CONTRACTOR
MCA	MINIMUM CIRCUIT AMPS
MECH	MECHANICAL
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MS	MOP SINK
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NOM	NOMINAL
NPCW	NON POTABLE WATER
OA	OUTSIDE AIR

ABBREVIATION	DESCRIPTION
P.C.	PLUMBING CONTRACTOR
PD	PRESSURE DROP
PRV	PRESSURE REDUCING VALVE
PSIA	POUNDS PER SQUARE INCH - ABSOLUTE
PSIG	POUNDS PER SQUARE INCH - GAUGE
RAG	RETURN AIR GRILLE OR REGISTER
RA	RETURN AIR
RH	RELATIVE HUMIDITY
RPM	REVOLUTIONS PER MINUTE
SAD	SUPPLY AIR DIFFUSER
SAG	SUPPLY AIR GRILLE
SA	SUPPLY AIR
SAN	SANITARY WASTE
SHR	SHOWER
SP	STATIC PRESSURE
SPHD	SPRINKLER HEAD
SPKR	SPRINKLER
S.S.	STAINLESS STEEL
TD	TRENCH DRAIN
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
UH	UNIT HEATER
UL	UNDERWRITERS LABORATORY
UON	UNLESS OTHERWISE NOTED
UR	URNIAL
U/G	UNDERGROUND (BELOW GRADE)
V	VENT
VD	VOLUME DAMPER
VSD	VARIABLE SPEED DRIVE
VTR	VENT THRU ROOF
W	WASTE
W&V	WASTE AND VENT
WC	WATER CLOSET
WCO	WALL CLEAN OUT
WB	WET BULB TEMPERATURE
WG	WATER GAUGE
WH	WALL HYDRANT

MECHANICAL SYMBOL LIST

SYMBOL	DESCRIPTION
	RECTANGULAR TAKE-OFF (SINGLE LINE)
	RECTANGULAR TAKE-OFF (DOUBLE LINE)
	ROUND TAKE-OFF (SINGLE LINE)
	ROUND TAKE-OFF (DOUBLE LINE)
	SPIN-IN FITTING (WITH VOLUME DAMPER)
	RECTANGULAR ELBOW (WITH TURNING VANES)
	RADIUS RECTANGULAR ELBOW
	RADIUS ROUND ELBOW
	RECTANGULAR ELBOW UP
	ROUND ELBOW UP
	DUCT UP (SINGLE LINE)
	RECTANGULAR ELBOW DOWN
	ROUND ELBOW DOWN
	DUCT DOWN (SINGLE LINE)
	CONCENTRIC TRANSITION (DOUBLE LINE)
	CONCENTRIC TRANSITION (SINGLE LINE)
	ECCENTRIC TRANSITION (DOUBLE LINE)
	ECCENTRIC TRANSITION (SINGLE LINE)
	CROSS SECTION OF SUPPLY AIR DUCT
	CROSS SECTION OF EXHAUST OR RETURN AIR DUCT
	FLEXIBLE CONNECTION (DUCT)
	SQUARE CEILING DIFFUSER
	RETURN OR EXHAUST CEILING GRILLE
	TRANSFER GRILLE
	FIRE DAMPER (HORIZONTAL)
	FIRE DAMPER (VERTICAL)
	SMOKE DAMPER
F/S	COMBINATION FIRE/SMOKE DAMPER (VERTICAL)
	VOLUME DAMPER (MANUALLY ADJUSTABLE)
M	MOTORIZED DAMPER
	ROOF VENTILATOR (PLAN VIEW)

METHODS OF NOTATION

S-1 10ø 350-4	SUPPLY DIFFUSER WITH SCHEDULE TAG, 10" DIAMETER NECK SIZE 350 CFM TYPICAL FOR 4.
R-1 22X10 640-2	RETURN REGISTER WITH SCHEDULE TAG, 22x10 NECK SIZE 640 CFM TYPICAL FOR 2 EXHAUST REGISTER (E) DESIGNATION SIMILAR.

EF 1 — EQUIPMENT DESIGNATION, (i.e. EXHAUST FAN NUMBER 1)

1 — CONSTRUCTION KEY NOTE NUMBER

MECHANICAL DRAWING INDEX

M1 MECHANICAL - HVAC PLAN
M2 MECHANICAL DETAILS
M3 MECHANICAL DETAILS
M4 MECHANICAL DETAILS

JLK Engineering Project Number: AEA1103-01

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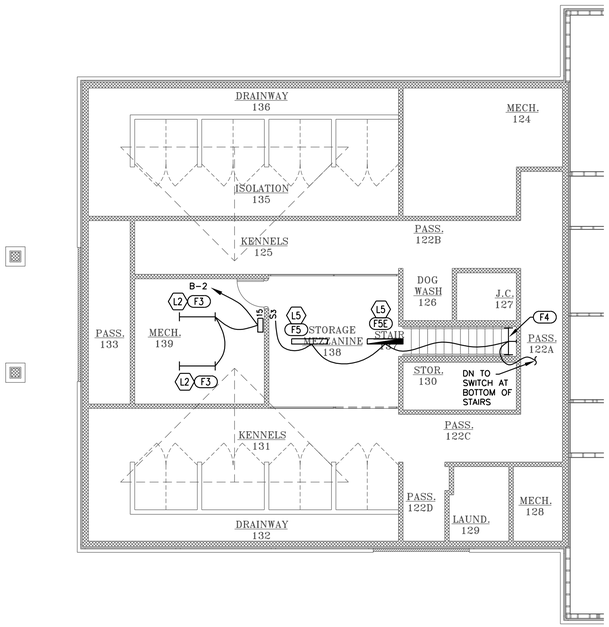
DRAWING TITLE: MECHANICAL DETAILS

PROJECT TITLE: PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY, GAYLORD, MICHIGAN

PROJECT NO.: 0160-10

DATE: APRIL 4, 2011

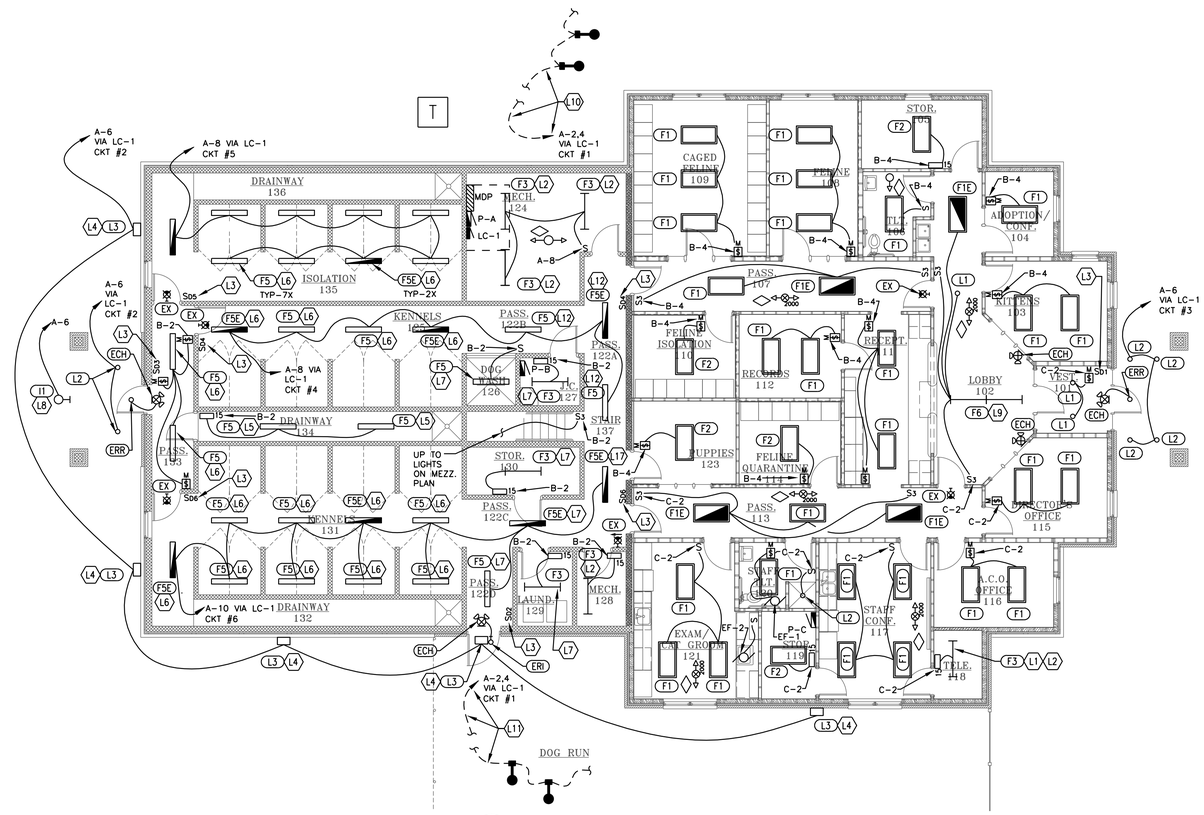
SHEET: M4



NORTH

LIGHTING PLAN – MEZZANINE

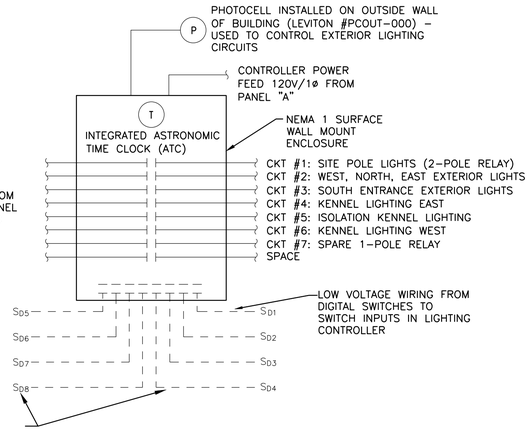
SCALE: 1/8" = 1'-0"



NORTH

LIGHTING PLAN – GROUND FLOOR

SCALE: 1/8" = 1'-0"



DIGITAL OVERRIDE SWITCHES:
PROVIDE ? BUTTON SWITCH STATION – LEVITON ZMDSW-XXW. COORDINATE LOCATIONS/QUANTITIES/COLORS OF ALL DIGITAL OVERRIDE SWITCHES WITH OWNER AND ARCHITECT PRIOR TO ORDERING & ROUGH-IN. LABEL ALL SWITCH BUTTONS USE (I.E. "SITE POLE LIGHTS", "KENNEL-WEST", ETC).

SD1 = 2 BUTTON SWITCH FOR CONTROLLING LIGHTING CKTS #1, #3.

SD2 = 2 BUTTON SWITCH FOR CONTROLLING LIGHTING CKTS #2, #6.

SD3 = 2 BUTTON SWITCH FOR CONTROLLING LIGHTING CKTS #1, #2.

SD4 = 1 BUTTON SWITCH FOR CONTROLLING THE KENNEL LIGHTING EAST CKT #4.

SD5 = 1 BUTTON SWITCH FOR CONTROLLING THE ISOLATION KENNEL LIGHTING CKT #5.

SD6 = 1 BUTTON SWITCH FOR CONTROLLING THE KENNEL LIGHTING WEST CKT #6.

LEVITON EZ-MAX PLUS STAND-ALONE RELAY SYSTEM "R08BD" (OR EQUAL BY COOPER, HUBBEL) WITH
(8) SWITCH INPUTS AND (8) RELAYS SPST WITH:
(6) 30A/120V 1-POLE RELAYS
(1) 30A/240V 2-POLE RELAYS
(1) 30A SPACES FOR FUTURE RELAYS

LIGHTING CONTROLLER "LC-1" DETAIL

NO SCALE

LIGHTING CONTROLLER LC-1 SEQUENCES:
ALL OUTDOOR AND KENNEL AREA LIGHTING SHALL BE CONTROLLED BY LIGHTING CONTROLLER LC-1.
ALL EXTERIOR LIGHTING CIRCUITS ARE SCHEDULED ON FROM PHOTOCELL AND SCHEDULED OFF AFTER NORMAL OPERATING HOURS (ADJUSTABLE IN CONTROLLER). DIGITAL OVERRIDE SWITCHES, WITH LOW VOLTAGE WIRING TO CONTACTS IN CONTROLLER, ARE PROVIDED TO ALLOW MANUAL TIMED OVERRIDE OF ALL RELAYS – THE CONTROLLER AUTOMATICALLY SHUTS OFF THE OVERRIDE AFTER A DETERMINED AMOUNT OF TIME (ADJUSTABLE IN TIMER/CONTROLLER).

OCCUPANCY SENSOR NOTES:

1. ALL SENSOR LOCATIONS ARE APPROXIMATE-REFER TO MANUFACTURER'S INSTALLATION INSTRUCTIONS PRIOR TO INSTALLATION. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO LOCATE AND AIM SENSORS IN THE CORRECT LOCATION REQUIRED FOR COMPLETE AND PROPER VOLUMETRIC COVERAGE WITHIN THE RANGE OF COVERAGE(S) OF CONTROLLED AREAS PER THE MANUFACTURER'S RECOMMENDATIONS. ROOMS SHALL HAVE COVERAGE TO COMPLETELY COVER THE CONTROLLED AREA TO ACCOMMODATE ALL OCCUPANCY HABITS OF SINGLE OR MULTIPLE OCCUPANTS AT ANY LOCATION WITHIN THE ROOMS(S). THE LOCATIONS AND QUANTITIES OF SENSORS SHOWN ON THE DRAWINGS ARE DIAGRAMMATIC AND INDICATE ONLY THE ROOMS WHICH ARE TO BE PROVIDED WITH SENSORS. THE CONTRACTOR SHALL PROVIDE ADDITIONAL SENSORS IF REQUIRED TO PROPERLY AND COMPLETELY COVER THE RESPECTIVE ROOM.

2. ULTRASONIC CEILING MOUNT SENSORS SHOULD BE LOCATED A MINIMUM OF SIX FEET FROM HVAC SUPPLY/RETURN VENTS.

3. CONTRACTOR IS RESPONSIBLE FOR PROPER SENSITIVITY AND TIME DELAY SETTINGS (FOR NON-ADAPTIVE PRODUCTS) MANUFACTURER'S RECOMMENDED PLACEMENT, AND FIELD VERIFICATION OF CIRCUITS WITH RESPECT TO POWER PACK PLACEMENT.

4. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFICATION OF REQUIRED NUMBER OF POWER PACKS; A) ONE POWER PACK IS REQUIRED FOR EACH CIRCUIT THAT IS TO BE CONTROLLED. B) DEPENDING ON THE TYPE OF SENSOR, UP TO THREE SENSORS CAN BE WIRED IN PARALLEL TO A SINGLE POWER PACK. C) IF MULTIPLE CIRCUITS ARE TO BE CONTROLLED BY A SENSOR, AUXILARY RELAYS MAY BE USED IN CONJUNCTION WITH A POWER PACK.
NOTE: ALL POWER PACKS SHALL COME WITH HVAC RELAY.

5. COORDINATE ALL SENSOR COLORS WITH ARCHITECT PRIOR TO ORDERING.

OCCUPANCY SENSOR SYMBOL LEGEND

SYMBOL	MODEL #	DESCRIPTION
15	ODS15-ID	WALL MOUNTED PASSIVE INFRARED OCCUPANCY SENSOR WITH ADAPTABILITY
M S	OSSMT-GDW	WALL MOUNTED MULTI-TECHNOLOGY OCCUPANCY SENSOR
500	OSC05-MO	CEILING MOUNTED MULTI-TECHNOLOGY OCCUPANCY SENSOR (500 SQ. FT)
500	OSC05-UO	CEILING MOUNTED ULTRASONIC OCCUPANCY SENSOR (500 SQ. FT)
1000	OSC10-MO	CEILING MOUNTED MULTI-TECHNOLOGY OCCUPANCY SENSOR (1000 SQ. FT)
1000	OSC10-UO	CEILING MOUNTED ULTRASONIC OCCUPANCY SENSOR (1000 SQ. FT)
2000	OSC20-MO	CEILING MOUNTED MULTI-TECHNOLOGY OCCUPANCY SENSOR (2000 SQ. FT)
2000	OSC20-UO	CEILING MOUNTED ULTRASONIC OCCUPANCY SENSOR (2000 SQ. FT)
1200	OSW12-MO	MULTI-TECHNOLOGY WALL/CORNER OCCUPANCY SENSOR
	OSWHB-IOW	HIGH BAY WALL MOUNTED PIR OCCUPANCY SENSOR
WV	OSWWV-IOW	WIDE VIEW WALL MOUNTED PIR OCCUPANCY SENSOR
	OSP20-RDO	POWER PACK (WITH HVAC RELAY)
	OSA20-ROO	ADD-A-RELAY POWER PACK

NOTES:

1) ALL OCCUPANCY SENSOR MODEL NUMBERS ARE LEVITON.
WATT-STOPPER AND COPPER MAY BE BID AS EQUAL.
2) COORDINATE ALL SENSOR COLORS WITH ARCHITECT PRIOR TO ORDERING.

KEYED CONSTRUCTION NOTES:

L1 CHAIN HANG FIXTURE AT 9' AFF.

L2 COORDINATE LIGHTING FIXTURE LAYOUT WITH MECHANICAL TRADES (TO AVOID CONFLICTS WITH DUCTWORK, PIPING, ETC.) PRIOR TO ROUGH-IN.

L3 DIGITAL LIGHTING SWITCH TO OVERRIDE LIGHTING CONTROLLER "LC-1" CIRCUITS. REFER TO LC-1 DETAIL ON DRAWING E1.

L4 MOUNT EXTERIOR WALL PACKS AT 9' AFF (TO TOP OF FIXTURE) – COORDINATE WITH ARCHITECTURAL EXTERIOR ELEVATIONS PRIOR TO ROUGH-IN.

L5 SURFACE MOUNT TO CEILING.

L6 CHAIN HANG FIXTURE AT 10' AFF (TO BOTTOM OF FIXTURE).

L7 CHAIN HANG FIXTURE AT 8'-6" AFF (TO BOTTOM OF FIXTURE).

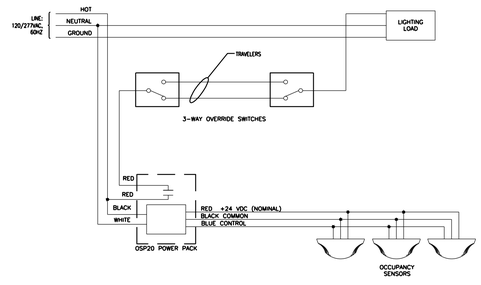
L8 MOUNT TYPE "11" MOTION FLOOD LIGHT UP HIGH IN GABLE END AT 12' AFF. COORDINATE WITH ARCHITECTURAL EXTERIOR ELEVATIONS PRIOR TO ROUGH-IN.

L9 SUSPEND AT 9'-6" AFF – COORDINATE WITH ARCHITECT.

L10 HOMERUN FOR SOUTH SITE LIGHTING – (2)-#8 + (1)-#10 GROUND IN 1" CONDUIT VIA LIGHTING CONTROLLER LC-1 (CKT #1). REFER TO ELECTRICAL SITE PLAN ES-1.0. COORDINATE WITH SITE/CIVIL TRADES.

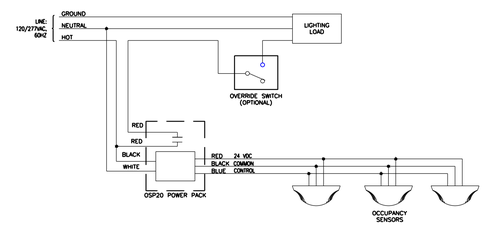
L11 HOMERUN FOR WEST SITE LIGHTING – (2)-#8 + (1)-#10 GROUND IN 1" CONDUIT VIA LIGHTING CONTROLLER LC-1 (CKT #1). REFER TO ELECTRICAL SITE PLAN ES-1.0. COORDINATE WITH SITE/CIVIL TRADES.

L12 CHAIN HANG FIXTURE AT 7'-10" AFF (TO BOTTOM OF FIXTURE).



OCCUPANCY SENSOR DETAIL WITH 3-WAY SWITCHES

NO SCALE



OCCUPANCY SENSOR DETAIL WITH SINGLE SWITCH

NO SCALE

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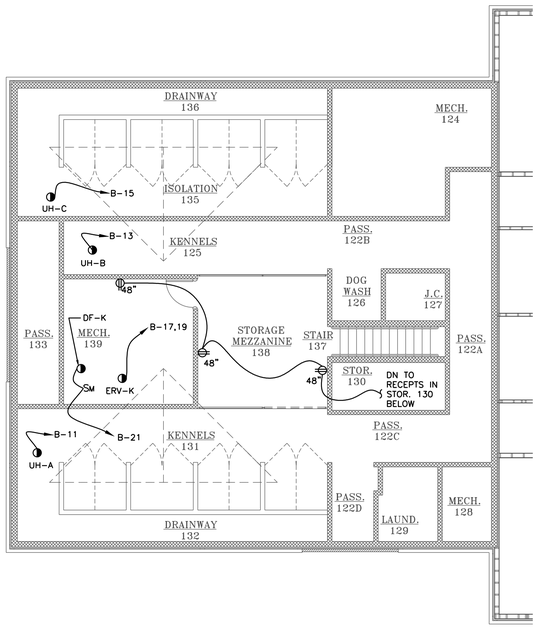
DRAWING TITLE: ELECTRICAL - LIGHTING PLAN

PROJECT TITLE: PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY, GAYLORD, MICHIGAN

PROJECT NO. 0160-10

DATE APRIL 4, 2011

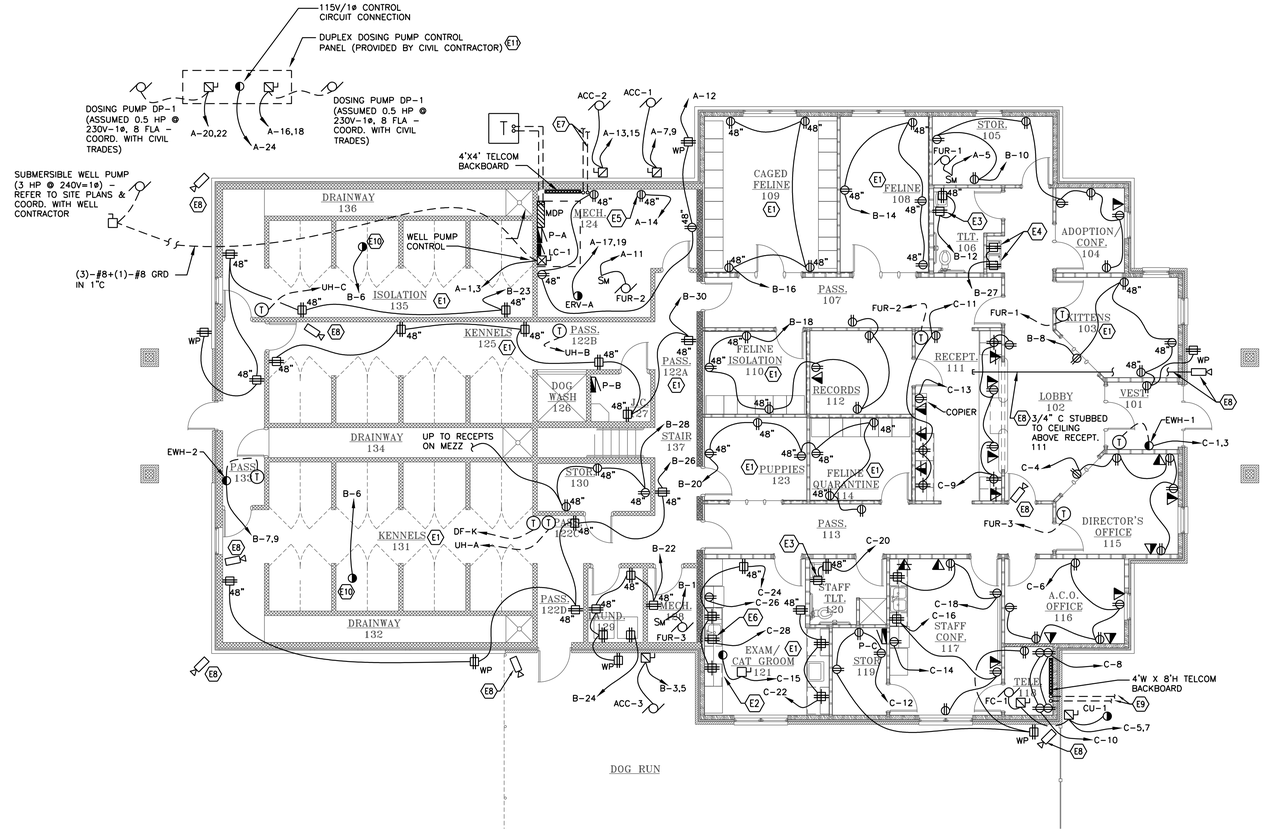
SHEET E1



NORTH

POWER PLAN – MEZZANINE

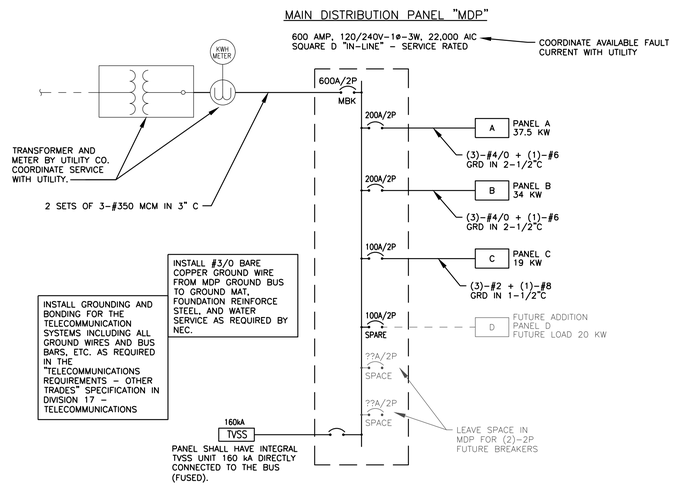
SCALE: 1/8" = 1'-0"



NORTH

POWER PLAN – GROUND FLOOR

SCALE: 1/8" = 1'-0"



ELECTRICAL ONE-LINE DIAGRAM

NO SCALE

KEYED CONSTRUCTION NOTES:

- E1 MOUNT ALL RECEPTACLES AND TELECOM OUTLETS IN ANIMAL ROOMS (I.E. KENNEL AREA, DOG ROOMS, CAT ROMS, EXAM ROOM, GROOMING, ADOPTION, ETC) AT 4 FEET AFF.
- E2 PROVIDE POWER TO DISHWASHER PER MANUFACTURER'S REQUIREMENTS.
- E3 PROVIDE RECEPTACLE UNDER LAVATORY FOR PLUG-IN SENSOR FAUCET. LOCATE UNDER LAV AND HIDDEN BEHIND LAV-SHIELD. - COORDINATE WITH PLUMBER PRIOR TO ROUGH-IN.
- E4 PROVIDE RECEPTACLES FOR ELECTRIC WATER COOLER. - COORDINATE WITH P.C. PRIOR TO ROUGH-IN.
- E5 RECEPTICLE FOR DOMESTIC WATER HEATER DWH-1 - COORDINATE WITH PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
- E6 PROVIDE GFCI RECEPTACLE BELOW SINK FOR FOOD DISPOSER CORD-END.
- E7 PROVIDE (2) - 3"ø CONDUITS DOWN FROM TELECOM BACKBOARD, BELOW GRADE (WITH LONG RADIUS 90° SWEEPS) OUT TO 5' FROM BLDG FOR PHONE/CABLE TV SERVICES - COORDINATE WITH UTILITIES AND SITE/CIVIL TRADES.
- E8 PROVIDE ROUGH-IN FOR SECURITY CAMERAS WHICH WILL BE PROVIDED/INSTALLED/WIRED BY OWNER'S SECURITY CONTRACTOR (COORDINATE PRIOR TO ROUGH-IN).
- E9 PROVIDE (2) - 3"ø CONDUITS DOWN FROM TELECOM BACKBOARD, BELOW GRADE (WITH LONG RADIUS 90° SWEEPS) OUT TO 5' FROM BLDG FOR CUSTOMER FIBER OPTIC CABLE - COORDINATE WITH UTILITIES, SITE/CIVIL TRADES, AND OWNER'S IT CONSULTANT.
- E10 PROVIDE HEAT TRACE CABLE AROUND PLENUM DRAIN PIPES THRU ATTIC - COORDINATE WITH PLUMBING TRADES.
- E11 INSTALL ALL POWER & CONTROLS FOR NEW SEPTIC DOSING PUMP STATION (PUMPS AND PUMP CONTROLLER(S) ARE PROVIDED BY SITE/CIVIL TRADES). REFER TO THE SITE/CIVIL PLANS/SPECIFICATIONS FOR DETAILS.

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DRAWING TITLE: ELECTRICAL - POWER PLAN

PROJECT TITLE: PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY, GAYLORD, MICHIGAN

PROJECT NO. 0160-10

DATE APRIL 4, 2011

SHEET E2

PANEL A — 225 A MLO — BUSSING SIZE 225 A — FED FROM MDP
OF POLES 42 — VOLTS 120/240 — NEUTRAL BUS 225 A — MOUNTING SURFACE
PHASE 1 — GROUND BUS? YES — TVSS? NO — AIC RMS AMPS 10,000
HERTZ 60 — ISOLATED GRD? NO
LOCATION MECH ROOM 124 — REMARKS X

CIRCUIT	BREAKER	DESCRIPTION	A	B
1	40A	WELL PUMP	2000	
3	2P	(3 HP)		2000
5	20A	FURNACE FUR-1	1600	
7	50A	ACC-1		3600
9	2P		3600	
11	20A	FURNACE FUR-2		1500
13	50A	ACC-2	3600	
15	2P			3600
17	35A	ERV-A	3200	
19	2P			3200
21	20A	SPARE	0	
23	20A	SPARE		0
25	20A	SPARE	0	
27		SPACE		–
29		SPACE	–	
31		SPACE		–
33		SPACE	–	
35		SPACE		–
37		SPACE	–	
39		SPACE		–
41		SPACE	–	
2	20A	SITE POLE LIGHTS	468	
4	2P			468
6	20A	EXTERIOR LIGHTS (L2,L3,I1)	590	
8	20A	KENNEL LIGHTS (135, 125, 122B, 122A) & MECH 124		1439
10	20A	KENNEL LIGHTS (131, 122A, 122C, 122D)	960	
12	20A	RECEPTS – MECH 124		720
14	20A	RECEPT – DWH-1	500	
16	15A	SEPTIC DOSING PUMP		900
18	2P	(ASSUMED 0.5 HP – COORD. BKR SIZE W. CIVIL)	900	
20	15A	SEPTIC DOSING PUMP		900
22	2P	(ASSUMED 0.5 HP – COORD. BKR SIZE W. CIVIL)	900	
24	20A	SEPTIC SYSTEM DOSING PUMP CONTROLS		200
26		SPACE	–	
28		SPACE		–
30		SPACE	–	
32		SPACE		–
34		SPACE	–	
36		SPACE		–
38		SPACE	–	
40		SPACE		–
42		SPACE	–	
KVA 37.4		CONNECTED AMPS 156 PHASE WATTS	18,318	18,527
DEMAND KVA 37.4		DEMAND AMPS 156		

NOTES:
1. PANEL SHALL BE SQUARE D NQ TYPE.

PANEL B — 225 A MLO — BUSSING SIZE 225 A — FED FROM MDP
OF POLES 42 — VOLTS 120/240 — NEUTRAL BUS 225 A — MOUNTING SURFACE
PHASE 1 — GROUND BUS? YES — TVSS? NO — AIC RMS AMPS 10,000
HERTZ 60 — ISOLATED GRD? NO
LOCATION JC 127 — REMARKS X

CIRCUIT	BREAKER	DESCRIPTION	A	B
1	20A	FURNACE FUR-3	1300	
3	35A	ACC-3		2800
5	2P		2800	
7	20A	ELEC WALL HEATER EWH-2		1500
9	2P		1500	
11	20A	UNIT HEATER UH-A		500
13	20A	UNIT HEATER UH-B	500	
15	20A	UNIT HEATER UH-C		500
17	45A	ERV-K	3800	
19	2P			3800
21	20A	DUCT FURNACE DF-K	250	
23	20A	RECEPTS – ISOLATION 135, PASS 133		900
25	20A	SPARE	0	
27	20A	ELECTRIC WATER COOLERS		800
29	20A	SPARE	0	
31		SPACE		–
33		SPACE	–	
35		SPACE		–
37		SPACE	–	
39		SPACE		–
41		SPACE	–	
2	20A	LIGHTS (126,127,128,129,130,133,134,138,137,139)	928	
4	20A	LIGHTS (103,104,105,106,107,108,109,110,111,112,114,123)		1312
6	20A	HEAT TRACE FOR ATTIC PLENUM DRAIN PIPES	500	
8	20A	RECEPTS – KITTENS 103, VEST 101		1080
10	20A	RECEPTS – ADOPTION 104, STOR. 105	1260	
12	20A	RECEPTS – TLT 106		360
14	20A	RECEPTS – FELINE 108	720	
16	20A	RECEPTS – CAGED FELINE 109		720
18	20A	RECEPTS – 110, 112, 107	1260	
20	20A	RECEPTS – 113, 114, 123		1260
22	20A	RECEPTS – MECH 128 & LAUNDRY 129	900	
24	20A	RECEPTS – CLOTHES WASHING MACHINE		600
26	20A	RECEPTS – KENNELS 131, PASS 122A,122C,122D	900	
28	20A	RECEPTS – STOR 130, MEZZ 138, MECH 139		1080
30	20A	RECEPTS – KENNELS 125, JC 127, PASS 122A	1080	
32		SPACE		–
34		SPACE	–	
36		SPACE		–
38		SPACE	–	
40		SPACE		–
42		SPACE	–	
KVA 34.9		CONNECTED AMPS 145 PHASE WATTS	17,698	16,412
DEMAND KVA 34.9		DEMAND AMPS 145		

NOTES:
1. PANEL SHALL BE SQUARE D NQ TYPE.

PANEL C — 100 A MLO — BUSSING SIZE 100 A — FED FROM MDP
OF POLES 30 — VOLTS 120/240 — NEUTRAL BUS 100 A — MOUNTING SURFACE
PHASE 1 — GROUND BUS? YES — TVSS? NO — AIC RMS AMPS 10,000
HERTZ 60 — ISOLATED GRD? NO
LOCATION TELE 118 — REMARKS FED FROM PANEL A VIA XFR SWITCH

CIRCUIT	BREAKER	DESCRIPTION	A	B
1	20A	ELEC WALL HEATER EWH-1	1000	
3	2P			1000
5	15A	DUCTLESS SPLIT AC-1/CU-1	1500	
7	2P			1500
9	20A	RECEPTS – RECEPTION SOUTH	900	
11	20A	RECEPTS – RECEPTION NORTH		540
13	20A	RECEPT – COPIER	930	
15	20A	DISHWASHER – EXAM/GROOM 121		1300
17	20A	SPARE	0	
19	20A	SPARE		0
21		SPACE	–	
23		SPACE		–
25		SPACE	–	
27		SPACE		–
29		SPACE	–	
2	20A	LIGHTS (101,102,113,115,116,117,118,119,120,121)	1576	
4	20A	RECEPTS – DIRECTOR OFFICE		900
6	20A	RECEPTS – ACO OFFICE	900	
8	20A	RECEPTS – DEDICATED TELCOM		360
10	20A	RECEPTS – DEDICATED TELCOM	360	
12	20A	RECEPTS – 118, 119		900
14	20A	RECEPT – 117 FRIDGE	700	
16	20A	RECEPTS – 117 WEST		540
18	20A	RECEPTS – 117 EAST	540	
20	20A	RECEPTS – STAFF TLT		360
22	20A	RECEPTS – EXAM/GROOM SOUTH	540	
24	20A	RECEPTS – EXAM/GROOM SOUTH		540
26	20A	RECEPT – EXAM FRIDGE	700	
28	20A	RECEPT – EXAM SINK DISPOSER		950
30	20A	SPARE	0	
KVA 18.5		CONNECTED AMPS 77.2 PHASE WATTS	9,646	8,890
DEMAND KVA 18.5		DEMAND AMPS 77.2		

NOTES:
1. PANEL SHALL BE SQUARE D NQ TYPE.

LIGHTING FIXTURE SCHEDULE

TYPE	DESCRIPTION	MANUFACTURERS	LAMPS	VOLTS/WATTS	REMARKS
F1	2'x4'x3.25" DEEP, RECESSED LAY-IN FLUORESCENT FIXTURE WITH FROSTED ACRYLIC LENS.	1. METALUX "ACCORD" SERIES 2AC-232-UNV-L8841-ER81 2. ENGINEER APPROVED EQUAL BY COLUMBIA, LITHONIA, OR DAY-BRITE	(2)-F32WT8/RS	120V / 58W	
F1E	FIXTURE SHALL BE SAME AS "F1" EXCEPT IT SHALL HAVE AN EMERGENCY BATTERY BALLAST (EBB). EMERGENCY BALLAST SHALL PROVIDE MINIMUM OF 1400 LUMENS (700 LUMENS FOR EACH LAMP) FOR 2 LAMPS IN PARALLEL FOR 90 MINUTES – IOTA MODEL I-232 OR EQUAL.	1. METALUX "ACCORD" SERIES 2AC-232-UNV-ELI232-L8841-ER81 2. ENGINEER APPROVED EQUAL BY COLUMBIA, LITHONIA, OR DAY-BRITE	(2)-F32WT8/RS	120V / 58W	
F2	2'X4', (3) LAMP, RECESSED LAY-IN FLUORESCENT FIXTURE WITH A12 0.125 ACRYLIC PRISMATIC DIFFUSER; FLUSH STEEL WHITE FRAME.	1. METALUX "2GC8" SERIES 2GC8-332A125-120V-ER81 2. ENGINEER APPROVED EQUAL	(3)-F32WT8/RS	120V / 96W	
F2E	FIXTURE SHALL BE SAME AS "F2" EXCEPT IT SHALL HAVE AN EMERGENCY BATTERY BALLAST (EBB). EMERGENCY BALLAST SHALL PROVIDE MINIMUM OF 1400 LUMENS (700 LUMENS FOR EACH LAMP) FOR 2 LAMPS IN PARALLEL FOR 90 MINUTES – IOTA MODEL I-232 OR EQUAL.	1. METALUX "2GC8" SERIES 2GC8-332A125-120V-EMI232-ER81 2. ENGINEER APPROVED EQUAL	(3)-F32WT8/RS	120V / 96W	
F3	12"X48", (2) LAMP FLUORESCENT FIXTURE; FLUSH STEEL WHITE FRAME.	1. METALUX "IAF" SERIES IAF-232-UNV-ER81-AYC-CHAIN/SET;WGICF-4FT 2. ENGINEER APPROVED EQUAL	(3)-F32WT8/RS	120V / 53W	
F3E	FIXTURE SHALL BE SAME AS "F3" EXCEPT IT SHALL HAVE AN EMERGENCY BATTERY BALLAST (EBB). EMERGENCY BALLAST SHALL PROVIDE MINIMUM OF 1400 LUMENS (700 LUMENS FOR EACH LAMP) FOR 2 LAMPS IN PARALLEL FOR 90 MINUTES – IOTA MODEL I-232 OR EQUAL.	1. METALUX "IAF" SERIES IAF-232-UNV-ELI232-ER81-AYC-CHAIN/ SET;WGICF-4FT 2. ENGINEER APPROVED EQUAL	(3)-F32WT8/RS	120V / 53W	
F4	3' LONG, (2) LAMP, FLUORESCENT WALL BRACKET FIXTURE WITH AN OPAL WHITE ACRYLIC REFRACTOR	1. METALUX "BC" SERIES BC-225-UNV-ER81 2. ENGINEER APPROVED EQUAL BY LITHONIA OR COLUMBIA	(2)-F25T8/RS	120V / 50W	
F5	4' LONG x 7" WIDE x 5" HIGH FLOURESCENT HIGH BAY FIXTURE: (3) – 32WT8 LAMPS; VAPORTITE FIXTURE WITH FIBERGLASS HOUSING; UL WET LABEL; PROGRAM RAPID START BALLAST (TDH <10%); SNAP ON BRACKETS FOR CHAIN/SURFACE MOUNT; 4,100K T8 LAMPS	1. METALUX "VT3" SERIES VT3-332-DR-UNV-ER81-WL-VT3-BKS2-PK 2. ENGINEER APPROVED EQUAL	(3)-32WT8/RS	120V / 80W	PROVIDE ALL NECESSARY OPTIONS/ACCESSORIES REQUIRED FOR COMPLETE & FUNCTIONAL SYSTEM (I.E. CONNECTORS, SUPPORTS/HANGERS, SUPPLEMENTARY SUPPORTS, J-BOXES, WIRING, ETC.). SUPPORT/HANG FIXTURES FROM, AT MINIMUM, 2 MOUNTING CONNECTIONS.
F5E	FIXTURE SHALL BE SAME AS "F5" EXCEPT IT SHALL HAVE AN EMERGENCY BATTERY BALLAST (EBB). EMERGENCY BALLAST SHALL PROVIDE MINIMUM OF 1400 LUMENS (700 LUMENS FOR EACH LAMP) FOR 2 LAMPS IN PARALLEL FOR 90 MINUTES – IOTA MODEL I-232 OR EQUAL.	1. METALUX "VT3" SERIES VT3-332-DR-UNV-ELI232-ER81-WL-VT3-BKS2-PK 2. ENGINEER APPROVED EQUAL	(3)-32WT8/RS	120V / 80W	PROVIDE ALL NECESSARY OPTIONS/ACCESSORIES REQUIRED FOR COMPLETE & FUNCTIONAL SYSTEM (I.E. CONNECTORS, SUPPORTS/HANGERS, SUPPLEMENTARY SUPPORTS, J-BOXES, WIRING, ETC.). SUPPORT/HANG FIXTURES FROM, AT MINIMUM, 2 MOUNTING CONNECTIONS.
F6	SUSPENDED DIRECT (23%) – INDIRECT (77%) FIXTURE WITH OPEN BAFFLE, STEEL CONSTRUCTION, ALUMINUM PERFORATED BLADE LOUVER, (2) 4' LONG CONTINUOUS 8' LENGTH, ADJUSTABLE AIRCRAFT CABLE	1. CORELITE "CLASS A" D/I SERIES #AB-WB-4T8-1C-120-AC48-JB-8 2. ENGINEER APPROVED EQUAL	(8)-F32WT8/RS	120V / 256W	
L1	LED DOWNLIGHT – 6" DIAMETER, IC RATED, AIR TIGHT HOUSING; DIMMABLE LED DRIVER MODULE WITH > .90 POWER FACTOR AT 120V AND INTEGRAL THERMAL PROTECTION; OPEN WHITE REFLECTOR WITH WHITE TRIM RING	1. HALO 900 SERIES LED WITH "ML709830ICAT120D" LED MODULE, H750ICAT HOUSING, AND "494P06" TRIM. 2. ENGINEER APPROVED EQUAL.	LED 3000K	120V / 15W	COORDINATE TRIM FINISH RING WITH ARCHITECT PRIOR TO ORDER.
L2	LED DOWNLIGHT – 6" DIAMETER, IC RATED, AIR TIGHT HOUSING; DIMMABLE LED DRIVER MODULE WITH > .90 POWER FACTOR AT 120V AND INTEGRAL THERMAL PROTECTION; REGRESSED LENS WITH WHITE BAFFLE AND WHITE TRIM RING (SHOWER RATED)	1. HALO 900 SERIES LED WITH "ML709830ICAT120D" LED MODULE, H750ICAT HOUSING, AND "493WBS06" TRIM. 2. ENGINEER APPROVED EQUAL.	LED 3000K	120V / 15W	COORDINATE TRIM FINISH RING WITH ARCHITECT PRIOR TO ORDER.
L3	16"W x 13"D x 10"H LED WALL PACK LIGHT, DIE-CAST ALUMINUM CONSTRUCTION, STAINLESS STEEL HARDWARE	1. LUMARK "WAL-PAK" SERIES LDWP-FL-4A-ED 2. ENGINEER APPROVED EQUAL.	LED 4000 LUMENS	120V / 40W	COORD. COLOR WITH ARCHITECT PRIOR TO ORDER
I1	WALL MOUNTED MOTION ACTIVATED FLOODLIGHT FIXTURE WITH: MOTION SENSOR; PHOTOCELL; (2) 150W PAR 38 LAMPS; UL LISTED FOR WET LOCATIONS.	1. LUMARK "WATCH GUARD" SERIES # MS254R 2. ENGINEER APPROVED EQUAL	(2)-150W PAR 38 FLOODS	120V / 300W	
EX	LED EXIT LIGHT: POLYCARBONATE HOUSING WITH WHITE FACE PLATE WITH UNIVERSAL DIRECTIONAL ARROWS, RED LED LAMPS AND HIGH IMPACT POLYCARBONATE LENS; FIXTURE SHALL BE DUAL 120/277V AC/EM OPERATION. UL 924 CODE COMPLIANCE. SEALED NICKEL CADMIUM BATTERY – 24 HR RECHARGE.	1. SURE-LITES LPX SERIES – LPX7-SD 2. ENGINEER APPROVED EQUAL BY LITHONIA OR PRESCOLITE	LED	120V / 1W	ARROWS AND FACES SHALL BE AS INDICATED ON DRAWINGS. PROVIDE MOUNTING HARDWARE AS REQUIRED FOR SINGLE OR DOUBLE SIDE AS REQUIRED BY CODE. NOTE: EX LIGHTS IN BAR SHALL BE BLACK COLOR (COORD. WITH OWNER PRIOR TO ORDER)
EXH	LED EXIT LIGHT WITH HIGH POWER BATTERY FOR EMERGENCY REMOTE CAPACITY: POLYCARBONATE HOUSING WITH WHITE FACE PLATE, WITH UNIVERSAL DIRECTIONAL ARROWS, RED LED LAMPS AND HIGH IMPACT POLYCARBONATE LENS; SEALED MAINTENANCE FREE LEAD CALCIUM BATTERY; 120/277 VOLT AC/EM OPERATION.	1. SURE-LITES "LPX" SERIES LPXH7-0-R-WH-SD 2. ENGINEER APPROVED EQUAL		120V / 3W	ARROWS AND FACES SHALL BE AS INDICATED ON DRAWINGS. PROVIDE MOUNTING HARDWARE AS REQUIRED FOR SINGLE OR DOUBLE SIDE AS REQUIRED BY CODE.
ECH	EXIT/EMERGENCY LIGHT COMBINATION WITH HIGH POWER BATTERY FOR EMERGENCY REMOTE CAPACITY: LED EXIT LIGHT, POLYCARBONATE HOUSING WITH WHITE FACE PLATE, EMERGENCY LIGHTING FIXTURE WITH: TWO 6 VOLT 5.4 WATT FULLY ADJUSTABLE CYLINDER TYPE LAMP HEADS; SEALED MAINTENANCE FREE LEAD CALCIUM BATTERY; AUTOMATIC CHARGER AND TRANSFER CIRCUIT; DUAL 120/277 VOLT AC/EM OPERATION.	1. SURE-LITES "LPX" SERIES LPXH7-0-R-WH-DH-SD 2. ENGINEER APPROVED EQUAL	(2) – 5.4W INCANDESCENT EMERGENCY LAMPS / LED EXIT LAMPS	120V / 5W	ARROWS AND FACES SHALL BE AS INDICATED ON DRAWINGS. PROVIDE MOUNTING HARDWARE AS REQUIRED FOR SINGLE OR DOUBLE SIDE AS REQUIRED BY CODE.
EM	EMERGENCY LIGHTING UNIT: WALL OR CEILING MOUNTED LIGHTING WITH TWO 12 WATT FULLY ADJUSTABLE MR16 LAMP HEADS. SEALED MAINTENANCE FREE NICKEL CADMIUM BATTERY.	1. SURE-LITES "CC" SERIES CC8MRT 2. ENGINEER APPROVED EQUAL	(2) – 12W MR16 LAMPS	120V / 4W	
ER1	REMOTE OUTDOOR EMERGENCY LIGHTING: WALL MOUNTED WEATHERPROOF FIXTURE WITH ONE HALOGEN SEALED BEAM LAMP – 8 WATTS AT 6 VOLTS. COORDINATE AVAILABLE COLOR (WHITE, GREY, BLACK) WITH ARCHITECT PRIOR TO ORDERING.	1. SURE-LITES "6T8Wxx" 6T8WGY 2. ENGINEER APPROVED EQUAL BY LITHONIA, HUBBLE	(1) – 8W HALOGEN SEALED LAMP	6V / 8W	WIRE TO BATTERY IN HIGH POWER CAPACITY EXIT SIGN OR EMERGENCY REMOTE LOCATED INSIDE BUILDING
ERR	REMOTE OUTDOOR EMERGENCY LIGHTING: RECESSED MOUNTED WEATHERPROOF FIXTURE WITH ONE INCANDESCENT SEALED BEAM LAMP – 8 WATTS AT 6 VOLTS;	1. SURE-LITES "GFR" SERIES GFR2703 2. ENGINEER APPROVED EQUAL	(1) – 8W INCANDESCENT LAMP	6V / 8W	WIRE TO BATTERY IN HIGH POWER CAPACITY EXIT SIGN OR EMERGENCY BATTERY LOCATED INSIDE BUILDING

JLK Engineering Project Number: AEA1103-01
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DRAWING TITLE
ELECTRICAL DETAILS

PROJECT TITLE
PROPOSED NEW ANIMAL CONTROL FACILITY FOR:
OTSEGO COUNTY
GAYLORD, MICHIGAN

PROJECT NO.
0160-10

DATE
APRIL 4, 2011

SHEET
E3

ELECTRICAL ABBREVIATION LIST

ABBREVIATION	DESCRIPTION
ACU	AIR CONDITIONING UNIT
AFF	ABOVE FINISHED FLOOR
AIC	AMPS INTERRUPTING CAPACITY
BKR	BREAKER
C	CONDUIT
CB	CIRCUIT BREAKER
CKT	CIRCUIT
CORD.	COORDINATION
CP	CIRCULATION PUMP
CU	CONDENSING UNIT
DISC	DISCONNECT
DP	DISTRIBUTION PANEL
DWG	DRAWING
EBU	EMERGENCY BATTERY UNIT
E.C.	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN
EHD	ELECTRIC HAND DRYER
EUH	ELECTRIC UNIT HEATER
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WALL HEATER
EM	EMERGENCY LIGHT
FLA	FULL LOAD AMPS
(F)	FUTURE
FU	FUSE
GFI	GROUND FAULT INTERRUPTER
GRD	GROUND
GRS	GALVANIZED RIGID STEEL
HOA	HAND–OFF–AUTO
HP	HORSEPOWER
HZ	HERTZ
IG	ISOLATED GROUND
JB	JUNCTION BOX
KW	KILOWATT
KWH	KILOWATT – HOURS
KVA	KILO VOLT–AMPERES

ABBREVIATION	DESCRIPTION
LP	LIGHTING PANEL
LC	LIGHTING CONTROLLER
M.C.	MECHANICAL CONTRACTOR
MCA	MINIMUM CIRCUIT AMPS
MCB	MAIN CIRCUIT BREAKER
MDP	MAIN DISTRIBUTION PANEL
MLO	MAIN LUGS ONLY
MTD	MOUNTED
MTR	MOTOR
N.E.C.	NATIONAL ELECTRIC CODE
NF	NON–FUSIBLE
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
NTS	NOT TO SCALE
P–A	PANEL "A"
P.C.	PLUMBING CONTRACTOR
RECEPT.	RECEPTACLE
SD	SMOKE DETECTOR
SPEC	SPECIFICATION
S.S.	STAINLESS STEEL
TB	TERMINAL BOX
TELCOM	TELECOMMUNICATIONS
TTB	TELEPHONE TERMINAL BACKBOARD
TYP	TYPICAL
UH	UNIT HEATER
UON	UNLESS OTHERWISE NOTED
U/G	UNDERGROUND (BELOW GRADE)
WP	WEATHERPROOF
WG	WIRE GUARD
XFMR	TRANSFORMER

METHODS OF NOTATION

FA — LIGHT FIXTURE DESIGNATION (I.E. FIXTURE TYPE "FA" – SEE FIXTURE SCHEDULE)

1 — CONSTRUCTION KEY NOTE NUMBER

A–3 — CIRCUIT HOMERUN TO PANEL "A" – CKT #3

STANDARD MOUNTING HEIGHTS

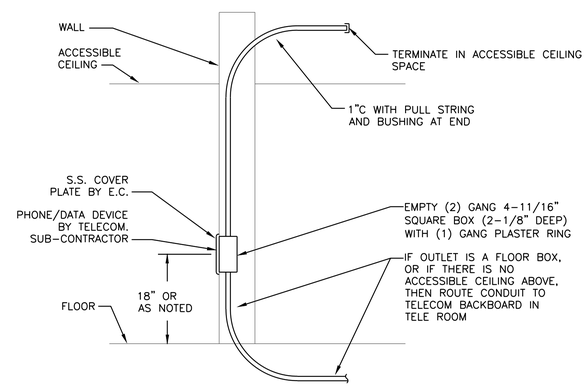
CONVENIENCE AND SPECIAL PURPOSE RECEPTACLE OUTLETS, TELE/DATA AND COMMUNICATIONS OUTLETS NOT OTHERWISE SPECIFIED	18" AFF TO CENTER OF BOX IN CMU WALLS – 16" AFF TO BOTTOM OF BOX
CONVENIENCE AND SPECIAL PURPOSE RECEPTACLE OUTLETS, TELE/DATA AND COMMUNICATIONS OUTLETS LOCATED IN CLASS 1 LOCATIONS	24" AFF TO BOTTOM OF BOX
CONVENIENCE AND SPECIAL PURPOSE RECEPTACLE OUTLETS ABOVE COUNTERS	6" ABOVE COUNTER TO CENTER OF BOX OR AS REQUIRED TO ACCOMODATE COUNTERS (REFER TO ARCHITECTURAL ELEVATIONS)
LIGHT SWITCHES, MOTOR CONTROL DEVICES AND FIRE ALARM PULL STATIONS NOT OTHERWISE SPECIFIED	50" AFF TO CENTER OF BOX IN CMU WALLS – 48" AFF TO TOP OF BOX
T–STATS, TEMP. SENSORS, CO2 SENSORS	50" AFF TO CENTER OF BOX IN CMU WALLS – 48" AFF TO TOP OF BOX
GFI RECEPTACLES IN TOILET ROOMS AND JANITOR CLOSETS NOT OTHERWISE SPECIFIED	48" AFF TO TOP OF BOX
LIGHTING AND RECEPTACLE BRANCH CIRCUIT PANELBOARDS AND LIGHTING CONTROLLERS	6'–6" AFF TO TOP OF ENCLOSURE

ELECTRICAL SYMBOL LIST

SYMBOL	DESCRIPTION
FA	FIXTURE TYPE
	RECESSED OR SURFACE MOUNTED FLUORESCENT LIGHTING FIXTURE
	RECESSED OR SURFACE MOUNTED FLUORESCENT EMERGENCY LIGHTING FIXTURE
	SURFACE OR PENDANT MOUNTED FLUORESCENT LIGHTING FIXTURE
	SURFACE OR PENDANT MOUNTED FLUORESCENT EMERGENCY LIGHTING FIXTURE
	WALL MOUNTED FLUORESCENT LIGHTING FIXTURE
	DOWNLIGHT LIGHTING FIXTURE
	DOWNLIGHT EMERGENCY LIGHTING FIXTURE
	WALLWASH OR DIRECTIONAL DOWNLIGHT
	WALL MOUNTED LIGHTING FIXTURE
	WALL SCONCE
	TRACK LIGHTING TRACK
	TRACK LIGHTING FIXTURE
	POLE MOUNTED LIGHTING FIXTURE (SINGLE HEAD)
	BOLLARD LIGHTING FIXTURE
	OUTDOOR WALL MOUNTED LIGHTING FIXTURE
	POLE MOUNTED LIGHTING FIXTURE (DOUBLE HEAD)
	EMERGENCY LIGHTING UNIT
	EXIT LIGHTING FIXTURE WITH EMERGENCY EGRESS LIGHTING AND BATTERY
	EXIT LIGHTING FIXTURE WITH DIRECTIONAL ARROWS (SHADED AREA INDICATES FACE)
	EXIT LIGHTING FIXTURE WITH DIRECTIONAL ARROWS (SHADED AREA INDICATES FACE)
	EXIT LIGHTING FIXTURE – WALL MOUNTED
S	SINGLE POLE TOGGLE SWITCH
S2	TWO POLE TOGGLE SWITCH
S3	3 WAY TOGGLE SWITCH
S4	4 WAY TOGGLE SWITCH
D	DIMMER SWITCH
D3	3 WAY DIMMER SWITCH
S S	DUAL SWITCHING FOR FLUORESCENT LIGHT FIXTURES
S3S3	3 WAY DUAL SWITCH FOR FLUORESCENT LIGHT FIXTURES
SO	OCCUPANCY SENSOR WALL SWITCH
SM	HORSE POWER RATED SWITCH
SD	DIGITAL SWITCH
LC	LIGHTING CONTROLLER/CONTRACTOR
C	CONTACTOR
P	PHOTOELECTRIC CONTROLLER
OS	CEILING OR WALL MOUNTED OCCUPANCY SENSOR
OP	OCCUPANCY SENSOR POWER PACK
EPC	EMERGENCY POWER TRANSFER CONTROLLER (LVS MODEL "EPC–A")
TC	TIME CLOCK

SYMBOL	DESCRIPTION
	SINGLE PHASE MOTOR
	THREE PHASE MOTOR
	COMBINATION MOTOR STARTER WITH DISCONNECT SWITCH
VSD	VARIABLE SPEED DRIVE COMBINATION MOTOR STARTER WITH DISCONNECT SWITCH
	NON–FUSIBLE DISCONNECT SWITCH
	FUSIBLE DISCONNECT SWITCH
SM	HORSE POWER RATED SWITCH
J	JUNCTION BOX
	HARD WIRE POWER CONNECTION
	HARD WIRE CONNECTION AT FLOOR BOX
	DATA OUTLET
6	DATA OUTLET WITH 6 DATA CABLE DROPS
	DATA OUTLET MTD 8" ABOVE COUNTERTOP
	DATA OUTLET – IN FLOOR BOX
	COMBINATION TELE/DATA OUTLET
0	COMBINATION TELE/DATA OUTLET – ROUGH–IN ONLY, NO CABLE DROP
2	COMBINATION TELE/DATA OUTLET – 2 CABLE DROPS
4	COMBINATION TELE/DATA OUTLET – 4 CABLE DROPS
	COMBINATION TELE/DATA OUTLET MOUNTED 8" ABOVE COUNTER TOP (UNLESS NOTED OTHERWISE)
0	COMBINATION TELE/DATA OUTLET 8" ABOVE COUNTERTOP – ROUGH–IN ONLY, NO CABLE DROPS
2	COMBINATION TELE/DATA OUTLET 8" ABOVE COUNTERTOP – 2 DROPS
2,4	COMBINATION TELE/DATA OUTLET – IN FLOOR BOX 2 = WITH (2) TELE/DATA OUTLETS 4 = WITH (4) TELE/DATA OUTLETS
	COMBINATION TELE/DATA OUTLET 8" ABOVE COUNTERTOP
A	COMBINATION TELE/DATA OUTLET – FLOOR MOUNTED A= WITH (1) TELE/DATA OUTLET B= WITH (2) TELE/DATA OUTLETS
	TELEPHONE OUTLET
	TELEPHONE OUTLET MTD 8" ABOVE COUNTERTOP
	TELEPHONE OUTLET – IN FLOOR BOX
48"	DATA OR TELE OUTLET – WALL MOUNTED @ 48"
	TELECOMMUNICATIONS BACKBOARD
	DUPLEX RECEPTACLE
48"	DUPLEX RECEPTACLE MOUNTED AT 48" ABOVE FLOOR (UNLESS NOTED OTHERWISE) (SIMILAR FOR ISOLATED GROUND, EMERGENCY AND GFI RECEPTACLES)
	QUAD RECEPTACLE
	DUPLEX RECEPTACLE MOUNTED 6" ABOVE COUNTER TOP (UNLESS NOTED OTHERWISE) OR AS REQUIRED TO ACCOMODATE COUNTERS (REFER TO ARCHITECTURAL ELEVATIONS) (SIMILAR FOR ISOLATED GROUND, EMERGENCY AND GFI RECEPTACLES)
	DUPLEX RECEPTACLE–GROUND FAULT INTERRUPTER
	DUPLEX RECEPTACLE–EMERGENCY POWER
	DUPLEX RECEPTACLE–ISOLATED GROUND
	QUAD RECEPTACLE–ISOLATED GROUND
F1	FLOOR MOUNTED RECEPTACLE (FLUSH MOUNT) F1= WITH (1) DUPLEX RECEPTACLE F2= WITH (2) DUPLEX RECEPTACLES
	SPECIAL RECEPTACLE–NEMA CONFIGURATION AS NOTED
T	T–STAT (BY OTHERS) ROUGHED IN BY E.C. @ 52" AFF WITH CONDUIT PATHWAY TO EQUIPMENT CONTROLS CONNECTION – COORD. WITH MECHANICAL TRADES
T	TEMPERATURE SENSOR (BY OTHERS) ROUGHED IN BY E.C. @ 52" AFF WITH CONDUIT PATHWAY TO EQUIPMENT CONTROLS CONNECTION – COORD. WITH MECHANICAL TRADES

SYMBOL	DESCRIPTION
	CIRCUIT BREAKER
	AUTOMATIC OR MANUAL TRANSFER SWITCH
	FUSE
	TRANSFORMER
	GROUND
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION
	CIRCUIT HOMERUN
	LIGHTING PANEL (LP)
	RECEPTACLE PANEL (RP)
	DISTRIBUTION PANEL
T	TRANSFORMER
M	UTILITY METER
CT	UTILITY CT CABINET
	SECURITY CAMERA
MD	MOTION DETECTOR
K	KEY SWITCH
DC	DOOR CONTACT
KP	KEY PAD
CR	CARD READER
IC	INTERCOM OUTLET
DP	DOOR CONTROL PANEL
PP	DOOR PUSH PAD



NOTES:
1) PROVIDE LABEL ON CONDUIT STATING OUTLET BOX LOCATION (I.E. ROOM NAME & NUMBER).

2) NOTE: ALL PHONE/DATA/VIDEO/SECURITY CABLING SHALL BE DONE BY OTHERS UNDER A SEPARATE CONTRACT. COORDINATE WITH OTHER SUB–CONTRACTORS PRIOR TO ROUGH–IN.

TV — TELECOM/VIDEO/SECURITY CAMERA OUTLET DETAIL
NO SCALE

ELECTRICAL DRAWING INDEX

E1 ELECTRICAL – LIGHTING PLAN
E2 ELECTRICAL – POWER PLAN
E3 ELECTRICAL DETAILS
E4 ELECTRICAL DETAILS

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DRAWING TITLE: ELECTRICAL DETAILS

PROJECT TITLE: PROPOSED NEW ANIMAL CONTROL FACILITY FOR: OTSEGO COUNTY, GAYLORD, MICHIGAN

PROJECT NO. 0160-10

DATE APRIL 4, 2011

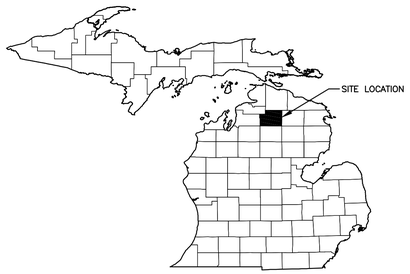
SHEET E4

BID 2011-08 ANIMAL CONTROL FACILITY
Site Civil Plans

CONSTRUCTION PLANS
FOR
OTSEGO COUNTY
ANIMAL CONTROL BUILDING
OTSEGO COUNTY
GAYLORD, MICHIGAN

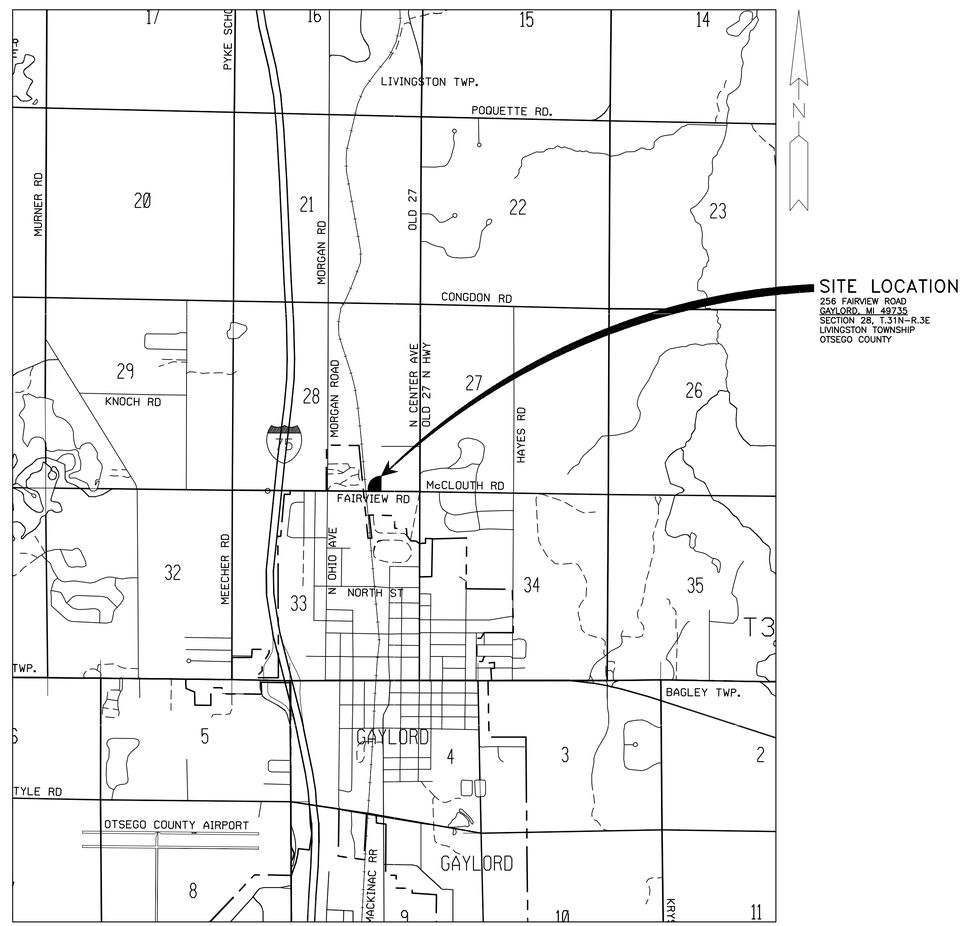
MDOT STANDARD PLANS INCLUDED IN THE CONSTRUCTION SET

- R-28-G SIDEWALK RAMP AND DETECTABLE WARNING TYPE F
- M0110a SHOULDER CLOSURE NECESSARY TO CONSTRUCT THE ENTRANCE DRIVE



KEY MAP
NOT TO SCALE

PROJECT CONTACTS	
ENTITY	CONTACT
OTSEGO COUNTY PLANNING AND ZONING	JOSEPH FERRIGAN, DIRECTOR BUILDING DEPARTMENT 1068 CROSS STREET GAYLORD, MI 49735 989-731-7420
OTSEGO COUNTY BUILDING DEPARTMENT	JOSEPH FERRIGAN, DIRECTOR BUILDING DEPARTMENT 1068 CROSS STREET GAYLORD, MI 49735 989-731-7420
OTSEGO COUNTY CONSERVATION DISTRICT	PATRICIA OSBORN,ADMINISTRATOR SOIL EROSION AND SHORELAND OFFICER 800 LIVINGSTON BLVD, STE. 4-A GAYLORD, MI 49735 989-732-4021
HEALTH DEPARTMENT – NORTHWEST MI COMMUNITY HEALTH AGENCY	95 LIVINGSTON BLVD. GAYLORD, MI 49735 989-732-1794
WADE TRIM	JOHN R. CIESIELSKI, PE 271 W. McCOY ROAD PO. BOX 618 GAYLORD, MI 48734 989-732-3584
CHARTER COMMUNICATIONS	STEVE THINEL 2155 M-119 PETOSKEY, MI 49770 231-631-5725
FRONTIER TELEPHONE	ROBIN WILLIAMS 3249 FOREST STREET GAYLORD, MI 49735 989-732-8503
MICHCON	CAROL VAN DAMME 1250 MICHCON LANE SW P.O. BOX 279 KALKASKA, MI 49646 231-347-0107
CONSUMERS ENERGY	GREG MORTINSEN 821 HASTINGS STREET TRAVERSE CITY, MI 49684 800-477-5050



LOCATION MAP
SCALE: 1" = 2000'

OWNER:
COUNTY OF OTSEGO
225 WEST MAIN STREET

SHEET INDEX	
GENERAL SHEETS	SHEET NO.
COVER SHEET	C-0.1
GENERAL NOTES PLAN	C-0.2
EXISTING CONDITIONS PLAN	C-1.0
SWPP PLAN	C-2.0
SWPP DETAILS PLAN	C-2.1
SITE PLAN	C-3.0
SITE DETAILS PLAN	C-3.1
GRADING PLAN	C-4.0
GRADING NOTES PLAN	C-4.1
UTILITY PLAN	C-5.0
UTILITY DETAILS PLAN	C-5.1
UTILITIES DETAILS PLAN	C-5.2
ELECTRICAL SITE PLAN	ES-1.0
LANDSCAPE PLAN	L-1.0
LANDSAPE DETAILS & NOTES PLAN	L-1.1

BID PLANS
NOT FOR
CONSTRUCTION

NOT VALID FOR CONSTRUCTION
UNLESS SIGNED AND DATED:

JOB NO.	SHEET
APE2019.01G	C-0.1

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PREPARED UNDER THE SUPERVISION OF:

STATE OF MICHIGAN
JOHN R. CIESIELSKI
ENGINEER
No. 54816
LICENSED PROFESSIONAL ENGINEER

I DO HEREBY CERTIFY THAT THESE PLANS HAVE BEEN PREPARED UNDER MY SUSTAINED REVIEW AND, TO THE BEST OF MY PROFESSIONAL KNOWLEDGE, UNDERSTANDING AND INFORMATION, THE DESIGN OF THIS PROJECT IS IN COMPLIANCE WITH THE OTSEGO COUNTY ZONING ORDINANCE DATED MARCH 20, 2010

Know what's **below.**
Call before you dig.

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PROJECT MANAGER:
C:\DOCUMENTS AND SETTINGS\JCIESELSKI\DESKTOP\EXPORT\APE201901F\PWBLDR\2011\0405\CG-PLTS.DWG - C-0.1 - PLOTTED 4/5/2011 11:41 AM BY CIESIELSKI, JOHN
FIELD BOOK INFORMATION:

CONSTRUCTION NOTES

1. ALL TREES, SHRUBS, AND OTHER TYPES OF VEGETATION NOT WITHIN THE LIMITS OF THE WORK OR NOT DESIGNATED ON THE PLANS OR BY THE ENGINEER TO BE REMOVED, SHALL BE CAREFULLY PROTECTED FROM DAMAGE OR INJURY DURING THE VARIOUS CONSTRUCTION OPERATIONS. ANY TREE, SHRUB OR OTHER TYPE OF VEGETATION NOT DESIGNATED TO BE REMOVED BUT WHICH IS DAMAGED BY THE CONTACTOR'S OPERATION SHALL BE REPAIRED OR REPLACED BY THE CONTRACTOR, AT HIS EXPENSE, AS DETERMINED BY THE ENGINEER.

2. ALL EXISTING CULVERTS, SEWERS, DRAINAGE STRUCTURES, MANHOLES, WATER GATE WELLS, HYDRANTS, WATER MAINS, UTILITY POLES, OVERHEAD LINES, UNDERGROUND CONDUITS, UNDERGROUND CABLES, PAVEMENT, OR OTHER TYPES OF IMPROVEMENTS WITHIN THE CONSTRUCTION LIMITS, NOT DESIGNATED ON THE PLANS TO BE REMOVED, SHALL BE CAREFULLY PROTECTED FROM DAMAGE DURING THE CONSTRUCTION OPERATIONS. ANY EXISTING STRUCTURE OR IMPROVEMENT NOT DESIGNATED TO BE REMOVED, BUT WHICH IS DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED BY THE CONTRACTOR, TO THE SATISFACTION OF THE OWNER, AT HIS EXPENSE.

3. ANY DEPOSITS OF DIRT OR DEBRIS IN SEWERS, CULVERTS, TILES, DRAINAGE STRUCTURES, MANHOLES, GATE WELLS, ETC. CAUSED BY THE CONTRACTOR SHALL BE CLEANED OUT AT THE CONTRACTOR'S EXPENSE.

4. ALL EXISTING OPEN DRAINS, FIELD AND ROADWAY DITCHES, DRAINAGE TILE, SEWERS, ENCLOSED DRAINS, NATURAL AND ARTIFICIAL WATERCOURSES, SURFACE DRAINAGE OR ANY OTHER TYPES OF DRAINAGE WITHIN THE LIMITS OF THE WORK SHALL BE MAINTAINED AND FREE TO DISCHARGE DURING CONSTRUCTION. ANY DRAINAGE FACILITY NOT DESIGNATED TO BE ABANDONED, BUT WHICH IS DAMAGED, OR ANY DRAINAGE INTERRUPTED BY THE CONTRACTOR'S OPERATION SHALL BE IMMEDIATELY REPAIRED, REPLACED, OR CLEARED BY THE CONTRACTOR. ALL COSTS INCURRED SHALL BE INCIDENTAL TO THE EXCAVATION, BACKFILLING AND COMPACTING OR GRADING OPERATIONS.

5. THE AREA WITHIN THE VICINITY OF THE NEW WORK SHALL BE DEWATERED PRIOR TO COMMENCING ANY CONSTRUCTION ACTIVITIES. THE DEPTH OF THE DEWATERING SHALL BE SUFFICIENT TO ALLOW THE WORK AREA TO REMAIN IN A DRY CONDITION DURING THE VARIOUS CONSTRUCTION OPERATIONS. THE COSTS INCURRED FOR FURNISHING, INSTALLING, MAINTAINING AND REMOVING THE DEWATERING EQUIPMENT SHALL BE AT THE CONTRACTOR'S EXPENSE.

6. WHEN EXISTING UTILITIES ARE SHOWN ON THE PLANS, THEIR LOCATIONS ARE APPROXIMATELY ONLY, AS SECURED IN THE FIELD INVESTIGATION AND/OR FROM AVAILABLE PUBLIC RECORDS, THE CONTRACTOR, PRIOR TO THE START OF CONSTRUCTION, SHALL CONTACT MISS DIG AND THE PUBLIC AGENCY OR UTILITY HAVING JURISDICTION TO REQUEST THE VERIFICATION OF ALL UTILITIES WITHIN THE CONSTRUCTION AREA.

7. WHEN EXISTING UTILITY LINES, STRUCTURES OR UTILITY POLES ARE ENCOUNTERED DURING THE PERFORMANCE OF THE WORK, THE CONTRACTOR, AT HIS EXPENSE, SHALL PERFORM HIS OPERATIONS IN SUCH A MANNER THAT THE SERVICE WILL BE UNINTERRUPTED.

8. THE CONTRACTOR SHALL EXPOSE ALL EXISTING UTILITY LINES PRIOR TO ANY EXCAVATION OPERATION, TO DETERMINE ANY CONFLICT WITH THE PROPOSED IMPROVEMENT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY RELOCATION REQUIRED AS A RESULT OF ANY CONFLICT OF EXISTING UTILITIES SHOWN ON THE PLANS, WITH THE PROPOSED IMPROVEMENT.

9. SHOULD IT BECOME NECESSARY TO MOVE ANY UTILITY STRUCTURE, LINE OR POLE SHOWN ON THE PLANS OR OTHERWISE FOUND NECESSARY TO BE MOVED, THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS WITH THE OWNER OF THE UTILITY FOR THE MOVING. ALL COSTS INCURRED FOR SUCH MOVING SHALL BE AT THE CONTRACTOR'S EXPENSE UNLESS INDICATED OTHERWISE.

10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY REMOVAL OR RELOCATION REQUIRED AS A RESULT OF ANY CONFLICT OF EXISTING UTILITY POLES (INCLUDING STREET LIGHT POLES, GUY POLES, TELEPHONE POLES, ETC.) WITH PROPOSED IMPROVEMENTS.

11. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR REMOVING OR RELOCATING UTILITY POLES WITH THE OWNER OF THE UTILITY POLE.

12. WHEN REQUIRED BY THE WORK, CONTRACTOR SHALL TEMPORARILY SUPPORT POLES IN THE VICINITY OF THE WORK AT NO ADDITIONAL COST TO THE OWNER. SUPPORT SHALL BE IN ACCORDANCE WITH AND TO THE SATISFACTION OF THE UTILITY COMPANY.

13. EXISTING SANITARY SEWERS, STORM SEWERS, DRAIN TILE, SEPTIC TANK BED TILES, WATER MAINS OR BUILDING SERVICES OR LEADS, THAT ARE ENCOUNTERED DURING THE PERFORMANCE OF THE WORK THAT REQUIRE RELOCATION OR ARE DAMAGED, SHALL BE RESTORED WITH NEW MATERIALS EQUAL IN QUALITY AND TYPE TO THE MATERIALS ENCOUNTERED.

14. THE NEW MATERIAL SHALL BE INSTALLED AS SPECIFIED IN THE CONTRACT DOCUMENTS AND PER THE REQUIREMENTS OF THE LOCAL AGENCIES. THE BEDDING AND BACKFILL MATERIAL, UNLESS OTHERWISE SPECIFIED, SHALL BE AN APPROVED CLASS II GRANULAR MATERIAL, COMPACTED TO 95% OF ITS MAXIMUM UNIT WEIGHT.

15. SEEPAGE BED TILE AND WATER MAINS SHALL BE REPLACED IN ACCORDANCE WITH THE REQUIREMENT OF THE AGENCY HAVING JURISDICTION.

16. THE RELOCATION OR PROTECTION OF EXISTING SEWERS, TILES, TILE FIELD, WATER MAINS OR BUILDING SERVICES AND LEADS SHALL BE AT THE CONTRACTOR'S EXPENSE, UNLESS OTHERWISE INDICATED IN THE CONTRACT DOCUMENTS.

17. UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS, THE CONTRACTOR, AT HIS EXPENSE, SHALL REMOVE ANY ABANDONED CULVERT, PIPE, SEWER, STRUCTURE OR PART OF A STRUCTURE WHICH IS TO BE REPLACED OR RENDERED USELESS BY THE NEW CONSTRUCTION. WHEN A SEWER OR CULVERT IS REMOVED AT A STRUCTURE, THE CONTRACTOR SHALL INSTALL A MASONRY BULKHEAD IN THE STRUCTURE. REMOVAL OF A CULVERT OR SEWER ALSO INCLUDES THE REMOVAL AND DISPOSAL OF ANY END TREATMENTS OR HEADWALLS.

18. THE REMOVAL OF EXISTING STRUCTURES SHALL CONSIST OF REMOVING AND SALVAGING THE EXISTING FRAME AND COVER. THE ENDS OF THE EXISTING PIPE SHALL BE PLUGGED AND BRACED. THE COMPLETE STRUCTURE SHALL BE REMOVED ENTIRELY AND DISPOSED OF. THE EXCAVATION SHALL BE BACKFILLED WITH SAND AND COMPACTED TO 95 PERCENT OF ITS MAXIMUM UNIT WEIGHT.

19. SALVAGED MATERIALS SHALL BECOME THE PROPERTY OF THE CONTRACTOR UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS, AND SHALL BE DISPOSED OF BY THE CONTRACTOR, AT HIS EXPENSE.

20. THE REMOVAL OF CONCRETE AND BITUMINOUS PAVEMENT AS CALLED FOR ON THE PLANS SHALL CONSIST OF REMOVING AND DISPOSING OF PAVEMENT AND SHALL INCLUDE BASE COURSES, SURFACE COURSES, INTEGRAL AND SEPARATE CURBS, INTEGRAL AND SEPARATE CURB AND GUTTERS, SIDEWALKS AND END HEADERS.

21. THE PAVEMENT SHALL BE REMOVED TO AN EXISTING JOINT OR CUT PARALLEL TO THE EXISTING PAVEMENT JOINTS. THE CUTTING SHALL BE ACCOMPLISHED BY USING A POWER-DRIVEN CONCRETE SAW. THE DEPTH OF THE SAW CUT SHALL BE A MINIMUM OF SIX (6) INCHES, TO INSURE THAT THE REMOVAL OF THE OLD PAVEMENT WILL NOT DISTURB OR DAMAGE THE SECTION OF PAVEMENT REMAINING IN PLACE.

22. RESIDUAL CONCRETE PAVEMENT SHALL NOT BE LESS THAN FIVE FEET MEASURED TRANSVERSELY, NOR LESS THAN SIX FEET LONGITUDINALLY MEASURED FROM A JOINT.

23. EARTH REMOVED DURING ANY PHASE OF THE EXCAVATION OR REMOVAL OPERATIONS, RESULTING IN A HOLE OR VOID, SHALL BE REPLACED BY BACKFILLING TO THE PROPOSED SUBGRADE WITH A SUITABLE GRANULAR MATERIAL. THE MATERIAL SHALL BE REPLACED BY THE CONTROLLED DENSITY METHOD AND SHALL BE COMPACTED TO 95% OF MAXIMUM UNIT WEIGHT.

24. THE FURNISHING, PLACING AND COMPACTING OF THE BACKFILL MATERIAL SHALL BE AT THE CONTRACTOR'S EXPENSE.

25. THE RIGHT-OF-WAY AND YARD AREAS NOT PAVED OR AGGREGATE SURFACED SHALL BE RESTORED IN ACCORDANCE WITH THE TYPE AND LOCATION SPECIFIED HEREIN UNLESS INDICATED OTHERWISE ON THE PLANS. THE DISTURBED AREAS MAY BE SHAPED BY "MACHINE GRADING" SECTION, LINE AND GRADE SHOWN ON THE PLANS. AREAS WHERE SLOPES ARE 1 OR 4 OR FLATTER SHALL BE RESTORED WITH TOPSOIL, SEED AND MULCH. SLOPES STEEPER THAN 1 OR 4 SHALL BE RESTORED WITH SOD.

26. ANY EXCESS MATERIAL FROM THE RESTORATION OPERATION SHALL BE DISPOSED OF BY THE CONTRACTOR AT HIS EXPENSE.

27. THE DISTURBED AREAS SHALL BE GRADED TO RECEIVE EITHER TOPSOIL AND SEED OR TOPSOIL AND SOD. THE TOPSOIL, SEE, SOD, FERTILIZER AND MULCH SHALL CONFORM TO THE REQUIREMENTS SPECIFIED ON THE PLANS.

28. THE CONTRACTOR, AT HIS EXPENSE, SHALL FURNISH, PLACE, AND COMPACT ANY ADDITIONAL FILL, MEETING THE APPROVAL OF THE ENGINEER, NEEDED TO RESTORE THE DISTURBED AREAS TO THE CROSS SECTIONS CALLED FOR ON THE PLANS OR AS DETERMINED BY THE ENGINEER.

29. UNLESS OTHERWISE SPECIFIED ON THE PLANS OR AS DETERMINED BY THE ENGINEER, THE CONCRETE REMOVED SHALL BE REPLACED WITH 3,500 PSI (23 MPA) CONCRETE OF THE THICKNESS REMOVED AND SHALL INCLUDE REINFORCING EQUAL TO THE EXISTING, IF THE EXISTING PAVEMENT WAS REINFORCED. THE CONSTRUCTION OF CONCRETE PAVEMENTS SHALL BE IN ACCORDANCE WITH THE CONSTRUCTION PLANS.

30. EXCESS EXCAVATION SHALL BE DEFINED AS ALL SURPLUS EARTH MATERIAL REALIZED FROM THE CONSTRUCTION THAT IS FREE OF BRUSH, ROOTS, STUMPS, BROKEN CONCRETE, PIPE, DEBRIS, AND OTHER EXTRANEOUS MATERIAL.

31. WHEN THE EXCESS EXCAVATION HAS NOT BEEN REQUESTED BY THE OWNER, THE CONTRACTOR SHALL REMOVE AND PROPERLY DISPOSE OF THE MATERIAL AT NO ADDITIONAL COST TO THE OWNER.

32. PROPER DISPOSAL OF ALL EXCESS EXCAVATION, INCLUDING TRANSPORTATION, GRADING, AND PROTECTION OF ADJACENT PROPERTIES SHALL BE CONSIDERED AS A FINAL CLEANUP ITEM. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS ITEM.

33. ANY BRUSH, ROOTS, STUMPS, BROKEN CONCRETE, PIPE, DEBRIS, AND OTHER EXTRANEOUS MATERIAL FROM THE CONSTRUCTION SHALL BECOME THE PROPERTY OF THE CONTRACTOR, AND SHALL BE DISPOSED OF PER ALL APPLICABLE LAWS, RULES OR REGULATIONS. REMOVAL AND DISPOSAL OF THE MATERIAL SHALL BE CONSIDERED AS PART OF FINAL CLEANUP. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS ITEM.

34. ALL TREES , STUMPS, BRUSH, SHRUBS, HEDGES, ROOTS, CORDUROY, LOGS, MATTED ROOTS, OTHER VEGETATION AND DEBRIS OCCURRING WITHIN THE CONTRACT LIMITS AS DEFINED ON THE PLANS OR AS DIRECTED BY THE ENGINEER, SHALL BE COMPLETELY REMOVED.

35. FOR EXCAVATION AREAS WITHIN ROADWAYS, PARKING LOTS, AND OTHER PAVED AREAS, THE TREES, STUMPS, AND ROOTS SHALL BE REMOVED TO A DEPTH OF NOT LESS THAN 12 INCHES BELOW THE SUBGRADE ELEVATION. IN ALL OTHER EXCAVATION AREAS, THE TREES, STUMPS, AND ROOTS SHALL BE REMOVED TO A DEPTH OF NOT LESS THAN 12 INCHES BELOW THE FINISH SURFACE ELEVATION,

36. SITES SHALL BE GRADED AS SPECIFIED ON THE PLANS OR AS DETERMINED BY THE ENGINEER. THE CONTRACTOR SHALL CARRY OUT THE GRADING OPERATION TO PREVENT STANDING WATER AND SOIL SATURATION DETRIMENTAL TO STRUCTURES AND IMPROVEMENTS. PROVISIONS SHALL BE MADE TO PRESERVE AND PROTECT TREES AND OTHER VEGETATION SPECIFIED ON THE PLANS OR DETERMINED BY THE ENGINEER AS NOT TO BE REMOVED.

37. TOPSOIL ENCOUNTERED ALONG THE ROUTE OF THE CONSTRUCTION SHALL BE PUSHED BACK AND PRESERVED FOR USE IN RESTORATION FOLLOWING COMPLETION OF THE CONSTRUCTION.

38. IF THERE IS INSUFFICIENT WORKING AREA, THE TOPSOIL MAY BE REMOVED, STOCKPILED AND LATER REPLACED ON THE ORIGINAL LOT OR PARCEL.

39. TOPSOIL SHALL BE SALVAGED IN AN AMOUNT EQUIVALENT TO THE QUANTITY REQUIRED BY THE PLANS. TOPSOIL SALVAGED IN EXCESS OF THAT REQUIRED BY THE PLANS OR AS REQUIRED BY THE ENGINEER WILL BE DISPOSED OF BY THE CONTRACTOR AT HIS EXPENSE.

40. BEFORE REMOVING TOPSOIL, ALL VEGETATION SHALL BE REDUCED TO A HEIGHT OF APPROXIMATELY FOUR INCHES AND ALL SUCH VEGETATION AND ALL BRUSH, STONES ROCKS, AND ANY OTHER OBJECTIONABLE LITTER OR FOREIGN MATERIAL SHALL BE REMOVED AND DISPOSED OF BEFORE THE GROUND IS BROKEN FOR TOPSOIL REMOVAL.

41. EQUIPMENT AND METHODS OF OPERATIONS SHALL BE SUCH AS TO AVOID THE LIFTING OF THE TOPSOIL. IF SOIL OR WEATHER CONDITIONS ARE UNSUITABLE, THE CONTRACTOR SHALL CEASE STRIPPING UNTIL STRIPPING CAN RESUMED IN A SUITABLE MANNER.

42. TOPSOIL SHALL BE REMOVED WITHIN THE GRADING LIMITS FOR CUTS AND SHALL BE REMOVED TO A WIDTH AND DEPTH SPECIFIED ON THE PLANS OR AS DETERMINED BY THE ENGINEER.

43. THE TOPSOIL SHALL BE STOCKPILED WITHIN THE LIMITS OF CONSTRUCTION IN AREAS DESIGNATED ON THE PLANS, OR IN AREAS OUT OF THE WAY OF CONSTRUCTION AS DETERMINED BY THE CONTACTOR. STOCKPILES SHALL BE LOCATED AND SHAPED SO AS TO AVOID DIVERSION OF STORM WATER RUNOFF, EITHER IN OR OUT OF THE LIMITS OF CONSTRUCTION, TOWARDS BUILDINGS, CREATION OF STANDING WATER OR INTERFERENCE OF CONTROLLED IRRIGATION. THE CONTRACTOR SHALL NOT PLACE TOPSOIL AROUND TRUNKS AND ROOT AREAS OF TREES TO BE PRESERVED.

44. TOPSOIL SHALL BE KEPT SEPARATED FROM OTHER EXCAVATED MATERIALS THAT ARE TO BE USED FOR EMBANKMENT AND SHALL BE COMPLETELY REMOVED FOR ANY DESIGNATED AREA PRIOR TO THE BEGINNING OF REGULAR EXCAVATION OR PLACING EMBANKMENT IN THE AREA.

45. THE TOPSOIL STOCKPILES SHALL BE LOCATED AS NEAR THE ORIGINAL LOCATION AS POSSIBLE AND NO PAYMENT WILL BE MADE FOR OVERHAUL.

46. AFTER THE COMPLETION OF CONSTRUCTION, THE TOPSOIL SHALL BE SCREENED THROUGH A 5/8-INCH MAXIMUM SIZE MESH SCREEN, SPREAD, GRADED, RAKED AND PREPARED FOR SEEDING OR SODDING.

47. THE SITE SHALL BE GRADED AS NECESSARY TO COMPLY WITH THE PLANS OR AS DETERMINED BY THE ENGINEER. THE SUBGRADE SHALL BE ROUGHLY ESTABLISHED BY CUT OR FILL, APPROXIMATELY PARALLEL TO PROPOSED FINISHED GRADES AND TO ELEVATIONS WHICH ALLOW FOR THICKNESS OF TOPSOIL AND INSTALLATION OF SITE OR ROADWAY IMPROVEMENTS.

48. IN FILL AREAS ALL DEBRIS SHALL BE REMOVED FROM THE AREA TO BE FILLED. ALL MATERIAL DETRIMENTAL TO SITE IMPROVEMENT SHALL BE REMOVED FROM THE SITE AND ACCEPTABLY DISPOSED OF.

49. ORIGINAL GROUND SHALL BE SCARIFIED AND BENCHED OR OTHERWISE TREATED TO PROVIDE ADEQUATE BOND AND TO PREVENT SLIPPAGE OF FILL.

50. FILL MATERIAL SHALL BE FREE OF DEBRIS OR OTHER DETRIMENTAL MATERIAL AND SHALL HAVE A MOISTURE CONTENT WITHIN 2 PERCENT OF OPTIMUM MOISTURE WHEN PLACED. ALL FILL SHALL BE COMPACTED TO A DENSITY NOT LESS THAN 95% OF THE MAXIMUM UNIT WEIGHT AND PLACED IN LAYERS NO LESS THAN NINE INCHES AND NO GREATER THAN 15 INCHES.

51. IF POSSIBLE FILLS OR EMBANKMENTS SHALL BE CONSTRUCTED WHEN THE GROUND IS FROST-FREE AND THERE IS FAVORABLE WEATHER. HOWEVER IF WINTER GRADING IS NECESSARY, ALL ICE AND SNOW SHALL BE REMOVED FROM THE SURFACE OF THE GROUND BEFORE THE FILL OR EMBANKMENT IS PLACED. NO FROZEN MATERIAL WILL BE ALLOWED IN THE FILL AREA OR IN THE EMBANKMENT BEING CONSTRUCTED. ANY FROZEN MATERIAL ON A PARTIALLY COMPLETED FILL SHALL BE REMOVED BEFORE PLACING ANY MORE FILL. THIS FROZEN MATERIAL SHALL BE STOCKPILED OUTSIDE THE GRADING LIMITS UNTIL THAWED. THAWED MATERIAL FROM THE STOCKPILED FROZEN MATERIAL MAY BE USED IN THE FILL AND EMBANKMENT AREAS.

52. THE SUBGRADE SHALL BE SMOOTHED PARALLEL TO PROPOSED FINISHED GRADES AND ELEVATIONS SPECIFIED ON THE PLANS. THE SUBGRADE SHALL BE SCARIFIED TO ASSURE BOND WITH THE TOPSOIL PRIOR TO SPREADING OF THE TOPSOIL.

53. THE TOPSOIL SHALL BE SPREAD UNIFORMLY TO PROVIDE A SMOOTH, EVEN SURFACE AT A FINISH GRADE SPECIFIED ON THE PLANS OR ACCEPTABLE TO THE ENGINEER. AFTER SPREADING, THE TOPSOIL SHALL BE COMPACTED LIGHTLY AS NECESSARY TO MINIMIZE SETTLEMENT. FINAL GRADES SHALL NOT VARY MORE THAN ONE-TENTH OF A FOOT FROM THE ELEVATIONS INDICATED ON THE PLANS.

54. FINISHED GRADING SHALL BE DONE WHEN THE GROUND IS FROST-FREE AND WEATHER IS FAVORABLE.

55. STRUCTURES TO BE ADJUSTED SHALL BE AS CALLED FOR ON THE PLANS OR AS INDICATED BY THE ENGINEER. ADJUSTMENT OR STRUCTURES SHALL APPLY WHERE THE ELEVATION OF THE CASTING IS EITHER RAISED 12 INCHES OR LESS, OR LOWERED SIX (6) INCHES OR LESS.

56. FOR BITUMINOUS RECONSTRUCTION OR NEW CONSTRUCTION PROJECTS THE FRAME AND COVER ON ALL NEW AND EXISTING STRUCTURES SHALL BE REMOVED AND THE STRUCTURE PLATED PRIOR TO PLACING THE BITUMINOUS BASE OR LEVELING COURSES. ALL BITUMINOUS BASE AND LEVELING COURSES SHALL BE PLACED OVER THE PLATED STRUCTURES. PRIOR TO PLACING THE BITUMINOUS BASE AND LEVELING COURSES SHALL BE SAWCUT A MINIMUM OF 5-FOOT BY 5-FOOT UNLESS OTHERWISE SHOWN ON THE PLANS. THE STRUCTURE SHALL BE ADJUSTED, BACKFILLED AND COMPACTED AS NOTED BELOW. SIX INCHES OF AGGREGATE BASE COURSE, UNLESS OTHERWISE NOTED ON THE PLANS, SHALL BE PLACED BELOW THE PROPOSED PAVEMENT. A MINIMUM OF 8-INCHES OF CONCRETE PAVEMENT, UNLESS OTHERWISE NOTED ON THE PLANS, SHALL BE PLACED TO THE ELEVATION OF THE ADJOINING BITUMINOUS BASE COURSE. THE BITUMINOUS WEARING COURSE AROUND THE STRUCTURE SHALL BE PLACED INTEGRAL WITH THE WEARING COURSE ON THE REMAINDER OF THE PROJECT.

57. SAWCUTTING, REMOVAL AND REPLACEMENT OF CONCRETE AND BITUMINOUS PAVEMENT, AND AGGREGATE BASE COURSE, SHALL BE INCIDENTAL TO THE ADJUSTING THE STRUCTURE UNLESS OTHERWISE NOTED IN THE CONTRACT DOCUMENTS.

58. THE EXISTING FRAME AND COVER SHALL BE CAREFULLY REMOVED AND STORED, AND SHALL BE REINSTALLED ON THE SAME STRUCTURE, UNLESS A NEW FRAME AND COVER ARE CALLED FOR ON THE PLANS.

59. THE BRICK COURSES OR CONCRETE ADJUSTMENT RINGS SHALL BE REMOVED OR INSTALLED AS NECESSARY TO ADJUST THE STRUCTURE'S FRAME AND COVER TO THE PROPER ELEVATION.

60. THE BRICK OR CONCRETE ADJUSTMENT RINGS SHALL BE SET IN MORTAR OR INSTALLED AS SHOWN ON THE PLANS AND AS DETERMINED BY THE ENGINEER.

61. THE OUTSIDE SURFACE OF THE NEW BRICK OR BLOCK STRUCTURES SHALL RECEIVE A MASONRY PLASTER COAT, A MINIMUM OF ½ INCH THICK.

62. THE STRUCTURE SHALL BE PROPERLY BACKFILLED WITH CLASS II GRANULAR MATERIAL, COMPACTED IN PLACE, AND MEETING THE APPROVAL OF THE ENGINEER.

63. THE FLOW IN THE ENTIRE SYSTEM SHALL BE MAINTAINED, AT THE CONTRACTOR'S EXPENSE, WHILE PERFORMING ANY PART OF THE WORK. ALSO, THE STRUCTURE SHALL BE CLEANED AND ALL UNSUITABLE MATERIAL SHALL BE DISPOSED OF AT THE CONTRACTOR'S EXPENSE.

64. STRUCTURES TO BE RECONSTRUCTED SHALL BE AS CALLED FOR ON THE PLANS OR AS DETERMINED BY THE ENGINEER. RECONSTRUCTION OF STRUCTURES SHALL APPLY WHERE THE ELEVATION OF THE CASTING MUST BE RAISED IN EXCESS OF 12 INCHES, LOWERED IN EXCESS OF SIX (6) INCHES, OR TO REBUILD PORTIONS OF THE EXISTING STRUCTURE WHICH ARE DETERIORATED.

65. FOR BITUMINOUS RECONSTRUCTION OR NEW CONSTRUCTION PROJECTS THE FRAME AND COVER ON ALL NEW AND EXISTING STRUCTURES SHALL BE REMOVED AND THE STRUCTURE PLATED PRIOR TO PLACING THE BITUMINOUS BASE OR LEVELING COURSES. ALL BITUMINOUS BASE AND LEVELING COURSES SHALL BE PLACED OVER THE PLATED STRUCTURES. PRIOR TO PLACING THE BITUMINOUS WEARING COURSE, THE BITUMINOUS BASE AND LEVELING COURSES SHALL BE SAWCUT A MINIMUM OF 5-FOOT BY 5-FOOT UNLESS OTHERWISE SHOWN ON THE PLANS. THE STRUCTURE SHALL BE RECONSTRUCTED, BACKFILLED AND COMPACTED AS NOTED BELOW. SIX INCHES OF AGGREGATE BASE COURSE, UNLESS OTHERWISE NOTED ON THE PLANS, SHALL BE PLACED BELOW THE PROPOSED PAVEMENT. A MINIMUM OF 8-INCHES OF CONCRETE PAVEMENT, UNLESS OTHERWISE NOTED ON THE PLANS, SHALL BE PLACED TO THE ELEVATION OF THE ADJOINING BITUMINOUS BASE COURSE. THE BITUMINOUS WEARING COURSE AROUND THE STRUCTURE SHALL BE PLACED INTEGRAL WITH THE WEARING COURSE ON THE REMAINDER OF THE PROJECT.

66. SAWCUTTING, REMOVAL AND REPLACEMENT OF CONCRETE AND BITUMINOUS PAVEMENT, AND AGGREGATE BASE COURSE, SHALL BE INCIDENTAL TO THE RECONSTRUCTING THE STRUCTURE UNLESS OTHERWISE NOTED IN THE CONTRACT DOCUMENTS.

67. THE EXISTING FRAME AND COVER SHALL BE CAREFULLY REMOVED AND STORED, AND SHALL BE REINSTALLED ON THE SAME STRUCTURE UNLESS A NEW FRAME AND COVER ARE CALLED FOR ON THE PLANS.

68. THE EXISTING CORBEL ENTRANCE SECTIONS OR PRECAST CONCRETE CHIMNEY TYPE ENTRANCE SHALL BE REMOVED ALONG WITH ANY ADDITIONAL BRICK COURSES OR PRECAST CONCRETE SECTIONS NECESSARY TO ACHIEVE THE AMOUNT OF RECONSTRUCTION CALLED FOR ON THE PLANS OR AS DETERMINED BY THE ENGINEER. THE NECESSARY BRICK WORK AND PRECAST CONCRETE SECTIONS SHALL BE INSTALLED TO MEET THE DESIGN GRADE.

69. MANHOLE STEPS SHALL BE FURNISHED AND SHALL BE INSTALLED, AS NECESSARY, SO THAT MAXIMUM SPACING IS 24-INCHES. THE BRICK OR CONCRETE ADJUSTMENT RINGS SHALL BE SET IN MORTAR OR INSTALLED AS SHOWN ON THE PLANS AND AS DETERMINED BY THE ENGINEER.

70. THE OUTSIDE SURFACE OF THE NEW BRICK OR BLOCK STRUCTURES SHALL RECEIVE A MASONRY PLASTER COAT, A MINIMUM OF ½ INCH THICK. THE STRUCTURE SHALL BE PROPERLY BACKFILLED WITH CLASS II GRANULAR MATERIAL, COMPACTED IN PLACE, AND MEETING THE APPROVAL OF THE ENGINEER.

71. THE FLOW IN THE ENTIRE SYSTEM SHALL BE MAINTAINED, AT THE CONTRACTOR'S EXPENSE, WHILE PERFORMING ANY PART OF THE WORK. ALSO, THE STRUCTURE SHALL BE CLEANED AND ALL UNSUITABLE MATERIAL SHALL BE DISPOSED OF AT THE CONTRACTOR'S EXPENSE.

GENERAL NOTES:

1. ALL TELEPHONE AND POWER POLES ARE TO BE SUPPORTED DURING CONSTRUCTION BY THE CONTRACTOR.
2. THE EXISTING ROAD AND SHOULDERS SHALL BE IN AS GOOD OR BETTER CONDITION AFTER PROJECT IS COMPLETE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REPAIRS TO THE SATISFACTION OF THE JURISDICTIONAL AUTHORITY.
3. NO PARKING OR STORAGE OF MATERIAL OR EQUIPMENT WILL BE ALLOWED WITHIN 10 FEET OF THE EDGE OF THE TRAVELED PORTION OF THE ROADWAY AND THEN THE PROPER SIGNS AND BARRICADES SHALL BE REQUIRED.
4. LOT LINES SHOWN ON PLANS ARE TO BE CONSIDERED APPROXIMATE ONLY.
5. ANY STORM SEWER ENCOUNTERED AND DAMAGED DURING CONSTRUCTION SHALL BE REPLACED IN KIND WITH NEW MATERIAL AND SHALL BE CONSIDERED INCIDENTAL.
6. THE CONTRACTOR IS RESPONSIBLE FOR PREPARING TRAFFIC MAINTENANCE RESTRICTIONS AND OBTAINING ANY PERMITS NECESSARY FOR SUCH FROM THE JURISDICTIONAL AUTHORITY.
7. ALL BACKFILL PLACED WITHIN A 1 ON 1 INFLUENCE OF A PAVED SURFACE OR THE CITY SHOULDER SHALL BE COMPACTED TO 95% OF MAXIMUM DENSITY.

PROTECTION, RESTORATION, AND REPAIR

1. ALL PROPERTY IRONS AND MONUMENTS, IF DISTURBED OR DESTROYED BY THE CONTRACTOR'S OPERATION, SHALL BE REPLACED BY A LICENSED LAND SURVEYOR AT THE CONTRACTOR'S EXPENSE.
2. CONTRACTOR SHALL REMOVE AND REPLACE ALL SIGNS, FENCES, SIDEWALKS, AND MAILBOXES AFFECTED BY CONSTRUCTION AT HIS EXPENSE.
3. THE CONTRACTOR SHALL PROTECT ALL PLANTING AREAS AND LANDSCAPING AREAS. IF DAMAGED, CONTRACTOR SHALL RESTORE ALL LANDSCAPING AT THE CONTRACTOR'S EXPENSE.
4. ALL CULVERTS OR HEADWALLS REMOVED OR DAMAGED DURING CONSTRUCTION SHALL BE REPLACED WITH NEW CORRUGATED GALVANIZED STEEL CULVERTS. LENGTH OF TUBE SHALL BE SUFFICIENT TO PROVIDE PROPERTY OWNER WITH THE SAME WIDTH DRIVEWAY PRIOR TO CONSTRUCTION AND LONG ENOUGH TO ALLOW FOR 3:1 SIDE SLOPES ON EACH SIDE OF THE DRIVE.
5. ALL DRAIN TILES ENCOUNTERED AND DAMAGED DURING CONSTRUCTION SHALL BE REPLACED IN KIND WITH NEW MATERIAL AND CONSIDERED INCIDENTAL

TRAFFIC CONTROL

1. THE CURRENT MDOT MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES, AS AMENDED SHALL BE USED FOR ALL TRAFFIC CONROL INCLUDING FLAGGING AND LIGHTED ARROWS. CONTRACTOR SHALL OBTAIN SIGNED SIGNING SKETCHES FROM THE COUNTY ROAD COMMISSION.
2. NO NIGHT TIME CLOSURES SHALL BE PERMITTED.
3. DETOUR ROUTES SHALL BE APPROVED BY THE JURISDICTIONAL AUTHORITY. DETOUR ROUTES SHALL BE APPROPRIATELY SIGNED.

BID PLANS
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CONSTRUCTION

Know what's **below.**
Call before you dig.

REV#	DATE	DESCRIPTION	BY

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P.O. BOX 479
GAYLORD, MI 49734

ANIMAL CONTROL BUILDING
LIVINGSTON TOWNSHIP, OTSEGO COUNTY, MICHIGAN
GENERAL NOTES PLAN

ISSUED FOR:	DATE:	BY:
APPROVALS	011111	JRC
APPROVALS	021611	JRC
BID	040511	JRC

JOB NO. APE2019.01G

SHEET C-0.2

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PROJECT MANAGER:–
FIELD BOOK INFORMATION:–
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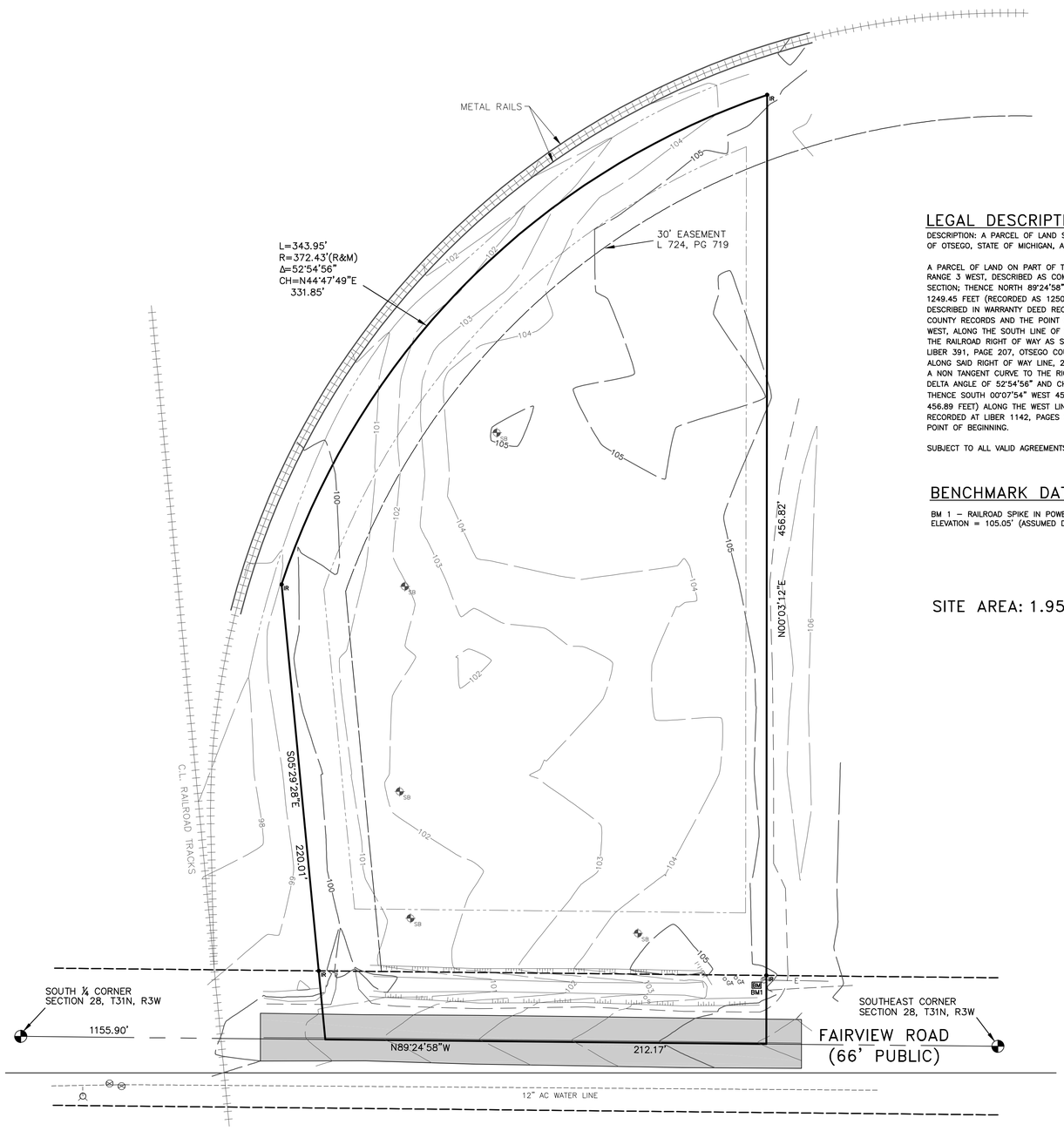

LEGAL DESCRIPTION

DESCRIPTION: A PARCEL OF LAND SITUATED IN THE TOWNSHIP OF LIVINGSTON, COUNTY OF OTSEGO, STATE OF MICHIGAN, AND DESCRIBED AS FOLLOWS, TO WIT:

A PARCEL OF LAND ON PART OF THE SOUTHEAST ¼ OF SECTION 28, TOWN 31 NORTH, RANGE 3 WEST, DESCRIBED AS COMMENCING AT THE SOUTHEAST CORNER OF SAID SECTION; THENCE NORTH 89°24'58" WEST, ALONG THE SOUTH LINE OF SAID SECTION, 1249.45 FEET (RECORDED AS 1250.00 FEET) TO THE WEST LINE OF PROPERTY DESCRIBED IN WARRANTY DEED RECORDED AT LIBER 1142, PAGES 248 AND 249, OTSEGO COUNTY RECORDS AND THE POINT OF BEGINNING; THENCE CONTINUING NORTH 89°24'58" WEST, ALONG THE SOUTH LINE OF SAID SECTION, 212.12 FEET TO THE EAST LINE OF THE RAILROAD RIGHT OF WAY AS SHOWN ON CERTIFICATE OF SURVEY RECORDED AT LIBER 391, PAGE 207, OTSEGO COUNTY RECORDS; THENCE NORTH 05°23'02" WEST, ALONG SAID RIGHT OF WAY LINE, 220.27 FEET; THENCE 343.95 FEET ALONG THE ARC OF A NON TANGENT CURVE TO THE RIGHT, SAID CURVE HAVING A RADIUS OF 372.43 FEET, DELTA ANGLE OF 52°54'56" AND CHORD OF NORTH 44°47'49" EAST 331.85 FEET; THENCE SOUTH 00°07'54" WEST 456.95 FEET (RECORDED AS SOUTH 00°06'29" WEST 456.89 FEET) ALONG THE WEST LINE OF PROPERTY DESCRIBED IN WARRANTY DEED RECORDED AT LIBER 1142, PAGES 248 AND 249, OTSEGO COUNTY RECORDS TO THE POINT OF BEGINNING.

SUBJECT TO ALL VALID AGREEMENTS, COVENANTS, EASEMENTS AND RESTRICTIONS, IF ANY.

BENCHMARK DATA:

BM 1 – RAILROAD SPIKE IN POWER POLE NEAR SOUTHEAST PROPERTY CORNER.
ELEVATION = 105.05' (ASSUMED DATUM)

SITE AREA: 1.95

LEGEND

MONITORING WELL
SOIL BORING
SECTION CORNER
FILL PORT
BOLLARD
SIGN POST
UTILITY MARKER
AIR CONDITIONING UNIT
SPRINKLER JUNCTION BOX
TELEPHONE MANHOLE
METER PIT
POST INDICATOR VALVE
GATE VALVE AND BOX
TRAVERSE POINT
PROPERTY CORNER SET
PROPERTY CORNER FOUND
PK NAIL
MONUMENT
BENCH MARK
METAL LIGHT POLE
FIRE HYDRANT
WATER VALVE
TELEPHONE PEDESTAL
CABLE TV PEDESTAL
ELECTRIC PEDESTAL
ELECTRIC HAND HOLE
POWER POLE
CIRCUIT BREAKER PANEL
CATCH BASIN ROUND
CATCH BASIN SQUARE
STORM MANHOLE
STORM SEWER END SECTION
SANITARY MANHOLE
SANITARY CLEANOUT
WATER SHUT OFF
GUY ANCHOR
MAIL BOX
NEWSPAPER BOX
FLOOD LIGHT
LAMP POLE
FLAG POLE
DECIDUOUS TREE MEDIUM
CONIFEROUS TREE MEDIUM
TOP OF BANK
TOE OF SLOPE
CENTER OF SWALE
EASEMENT
PROPERTY BOUNDARY
SECTION LINE
RIGHT OF WAY LINE
BUILDING SETBACK LINE
BUILDING BORDER LINE
FIBER OPTIC
ELECTRIC OVERHEAD
UNDERGROUND ELECTRIC
UNDERGROUND TELEPHONE
NATURAL GAS
WATER LINE
STORM SEWER
SANITARY SEWER
CURB & GUTTER
EDGE OF PAVEMENT
EDGE OF GRAVEL
CENTER LINE OF PAVEMENT
FENCE
LANDSCAPE BOUNDARY LINE
MAJOR CONTOUR
MINOR CONTOUR
GUARD RAIL
CENTER OF RAILROAD TRACK
ASPHALT
CONCRETE

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NOT FOR
CONSTRUCTION

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EXISTING CONDITIONS PLAN

ISSUED FOR:	DATE:	BY:
APPROVALS	011111	JRC
APPROVALS	021611	JRC
BID	040511	JRC

JOB NO. APE2019.01G

SHEET C–1.0

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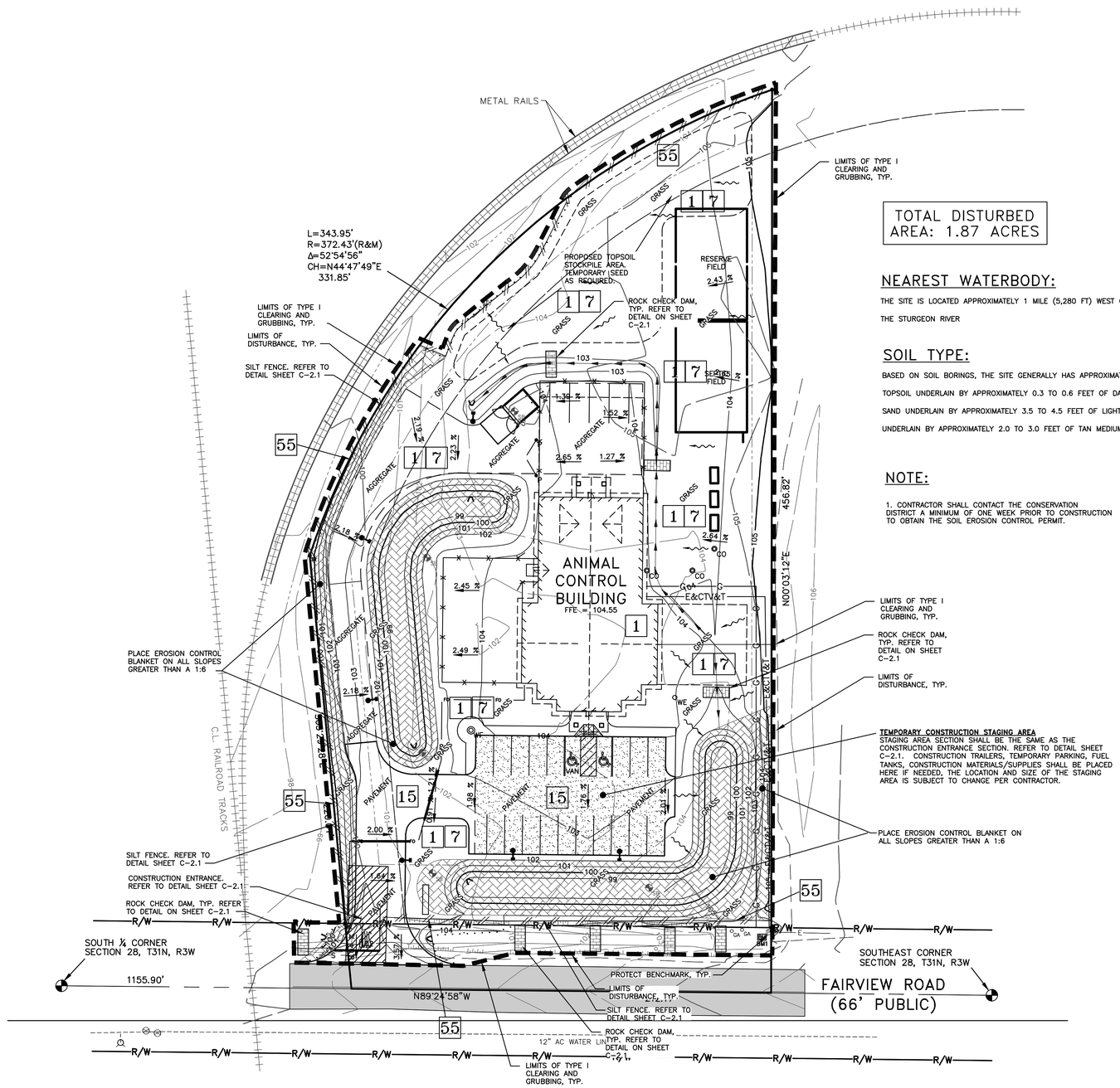
PROJECT MANAGER:–
C:\DOCUMENTS AND SETTINGS\JCIESELSKI\DESKTOP\EXPORT\APE2019\01\PLOTS\APE2019\01PLOTS.DWG – C-1.0 – PLOTTED 4/5/2011 11:42 AM BY CIESELSKI, JOHN
FIELD BOOK INFORMATION:–



TOTAL DISTURBED AREA: 1.87 ACRES

NEAREST WATERBODY:

THE SITE IS LOCATED APPROXIMATELY 1 MILE (5,280 FT) WEST OF A TRIBUTARY OF THE STURGEON RIVER

SOIL TYPE:

BASED ON SOIL BORINGS, THE SITE GENERALLY HAS APPROXIMATELY 0.4 FEET OF TOPSOIL UNDERLAIN BY APPROXIMATELY 0.3 TO 0.6 FEET OF DARK BROWN LOAMY SAND UNDERLAIN BY APPROXIMATELY 3.5 TO 4.5 FEET OF LIGHT BROWN MEDIUM SAND UNDERLAIN BY APPROXIMATELY 2.0 TO 3.0 FEET OF TAN MEDIUM SAND.

NOTE:

1. CONTRACTOR SHALL CONTACT THE CONSERVATION DISTRICT A MINIMUM OF ONE WEEK PRIOR TO CONSTRUCTION TO OBTAIN THE SOIL EROSION CONTROL PERMIT.

LEGEND

- LIMITS OF DISTURBANCE/ CLEARING AND GRUBBING
- PROPOSED SILT FENCE
- EXISTING ASPHALT
- EROSION CONTROL BLANKET
- EXISTING OVERLAND FLOW PATH
- EROSION CONTROL SYMBOL (36)
- ROCK CHECK DAM

N

SOIL EROSION & SEDIMENTATION CONTROL NOTES

1. CONTRACTOR SHALL PLACE ALL SOIL EROSION & SEDIMENTATION CONTROL MEASURES AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER IN ACCORDANCE WITH THE MICHIGAN UNIFIED KEYING SYSTEM, AS SHOWN ON THIS SHEET.
2. CONSTRUCTION OPERATIONS SHALL BE SCHEDULED AND PERFORMED SO THAT PREVENTATIVE EROSION CONTROL MEASURES ARE IN PLACE PRIOR TO EXCAVATION AND TEMPORARY STABILIZATION MEASURES ARE IN PLACE IMMEDIATELY FOLLOWING BACK FILLING AND/OR GRADING OPERATIONS.
3. FILL DISPOSAL AREAS WILL BE SELECTED AND APPROVED AT THE PRE-CONSTRUCTION MEETING.
4. SPECIAL PRECAUTIONS WILL BE TAKEN IN THE USE OF CONSTRUCTION EQUIPMENT TO PREVENT SITUATIONS THAT PROMOTE EROSION.
5. THE CONTRACTOR SHALL LIMIT THE USE OF HEAVY EQUIPMENT AND OTHER CONSTRUCTION EQUIPMENT ON THE UNPROTECTED UPGRADE.
6. CLEANUP WILL BE DONE IN A MANNER TO INSURE THAT EROSION CONTROL MEASURES ARE NOT DISTURBED.
7. THE PROJECT WILL CONTINUALLY BE INSPECTED FOR SOIL EROSION AND SEDIMENTATION CONTROL COMPLIANCE. DEFICIENCIES WILL BE CORRECTED BY THE CONTRACTOR WITHIN 24 HOURS.
8. TEMPORARY EROSION CONTROL MEASURES SHALL BE COMPLETELY REMOVED BY THE CONTRACTOR UPON ESTABLISHMENT OF PERMANENT CONTROL MEASURES.
9. CONSTRUCTION WILL DISTURB LESS THAN 5 ACRES, THUS A NPDES STORM WATER DISCHARGE PERMIT WILL **NOT** BE REQUIRED.
10. AREA OF DISTURBANCE IS **1.87** ACRES.
11. ALL ROADS WITHIN THE INFLUENCE OF THE PROJECT MUST REMAIN CLEAN AT ALL TIMES. CONTRACTOR SHALL SWEEP STREETS AS DIRECTED BY OTSEGO COUNTY OR THE ENGINEERING CONSULTANT.
12. BEST MANAGEMENT PRACTICES FOR SOIL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE USED ON THIS PROJECT AS SHOWN ON THE PLANS AND AS DEFINED BY THE ENGINEER.
13. THE CONTRACTOR SHALL SUBMIT A DETAILED SOIL EROSION AND SEDIMENTATION CONTROL PLAN AND OBTAIN AN ACT 451 PART 91, SOIL EROSION AND SEDIMENTATION CONTROL PERMIT. THE CONTRACTOR IS RESPONSIBLE FOR THE PAYMENT OF APPLICATION FEES, REVIEW FEES, INSPECTION FEES, BONDS, ETC. NO EARTH CHANGES OR EXCAVATION SHALL BE STARTED PRIOR TO THE ISSUANCE OF THIS PERMIT.
14. PROJECT IS LOCATED DIRECTLY ADJACENT TO THE COLE DRAIN. PROJECT IS NOT WITHIN THE 100 YEAR FLOOD PLAIN.
15. THE FOLLOWING INDICATES SOIL EROSION KEY STANDARDS, [##] , SEE MICHIGAN UNIFIED KEYING SYSTEM FOR EROSION CONTROL KEY NUMBERS.
16. TEMPORARY SEEDING SHALL BE MDOT TUF SEED MIXTURE PLACED ACCORDING TO SPECIFICATIONS. TEMPORARY SEEDING SHALL BE MAINTAINED DURING THE PERIOD OF CONSTRUCTION UNTIL THE CONTRACT HAS BEEN COMPLETED AND ACCEPTED.

MAINTENANCE

ALL MEASURES STATED ON THIS SITE MAP SHALL BE MAINTAINED IN FULLY FUNCTIONAL CONDITION UNTIL NO LONGER REQUIRED FOR A COMPLETED PHASE OF WORK OR FINAL STABILIZATION OF THE SITE. ALL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE CHECKED BY A QUALIFIED PERSON IN ACCORDANCE WITH THE APPLICABLE PERMIT AND REPAIRED IN ACCORDANCE WITH THE FOLLOWING:

1. INLET PROTECTION DEVICES AND BARRIERS SHALL BE REPAIRED OR REPLACED IF THEY SHOW SIGNS OF UNDERMINING OR DETERIORATION.
2. ALL SEEDED AREAS SHALL BE CHECKED REGULARLY TO SEE THAT A GOOD STAND IS MAINTAINED. AREAS SHOULD BE FERTILIZED, WATERED, AND RESEEDED AS NEEDED.
3. SILT FENCES SHALL BE REPAIRED TO THEIR ORIGINAL CONDITIONS IF DAMAGED. SEDIMENT SHALL BE REMOVED FROM THE SILT FENCES WHEN IT REACHES ONE-HALF THE HEIGHT OF THE SILT FENCE.
4. THE CONSTRUCTION EXITS SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOW OF MUD ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING OF THE CONSTRUCTION EXITS AS CONDITIONS DEMAND.
5. THE TEMPORARY PARKING AND STORAGE AREA SHALL BE KEPT IN GOOD CONDITION (SUITABLE FOR PARKING AND STORAGE). THIS MAY REQUIRE PERIODIC TOP DRESSING OF THE TEMPORARY PARKING AREA AS CONDITIONS DEMAND.
6. RESPONSIBLE PERSON DURING CONSTRUCTION WILL BE THE CONTRACTOR. RESPONSIBLE PERSON AFTER CONSTRUCTED HAS CEASED AND THE SITE IS STABILIZED WILL BE THE OWNER.

MICHIGAN UNIFIED KEYING SYSTEM

1	STRIPPING & STOCKPILING TOPSOIL	TOPSOIL MAY BE STOCKPILED ABOVE BORROW AREAS TO ACT AS A DIVERSION. STOCKPILE SHOULD BE TEMPORARILY SEEDED
7	HYDRO-SEEDING	EFFECTIVE ON LARGE AREAS. MULCH TACKING AGENT USED TO PROVIDE IMMEDIATE PROTECTION UNTIL GRASS IS ROOTED. SHOULD INCLUDE PREPARED TOPSOIL BED
15	PAVING	PROTECTS AREAS WHICH CANNOT OTHERWISE BE PROTECTED, BUT INCREASES RUNOFF, VOLUME AND VELOCITY. IRREGULAR SURFACE WILL HELP SLOW VELOCITY
55	GEOTEXTILE SILT FENCE	USES GEOTEXTILE AND POSTS OR POLES. MAY BE CONSTRUCTED OR PREFABRICATED. EASY TO CONSTRUCT AND LOCATE AS NECESSARY

BID PLANS NOT FOR CONSTRUCTION

30 15 0 30 60
SCALE IN FEET

REV#	DATE	DESCRIPTION	BY

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Gaylord, MI 49735
868.732.3584/800.968.4440
FAX: 989.732.8021
www.wadetrim.com

Building relationships on a foundation of excellence

ANTHONY P. ESSON ARCHITECT
P.O. BOX 479
GAYLORD, MI 49734
ANIMAL CONTROL BUILDING
LIVINGSTON TOWNSHIP, OTSEGO COUNTY, MICHIGAN
SWPP PLAN

ISSUED FOR:	DATE:	BY:
APPROVALS	011111	JRC
APPROVALS	021611	JRC
BID	040511	JRC

JOB NO: APE2019.01G

SHEET C-2.0

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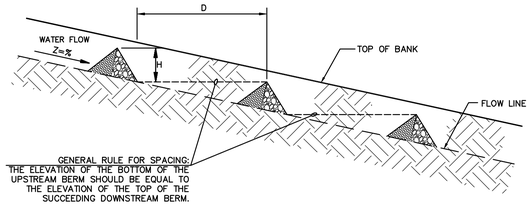
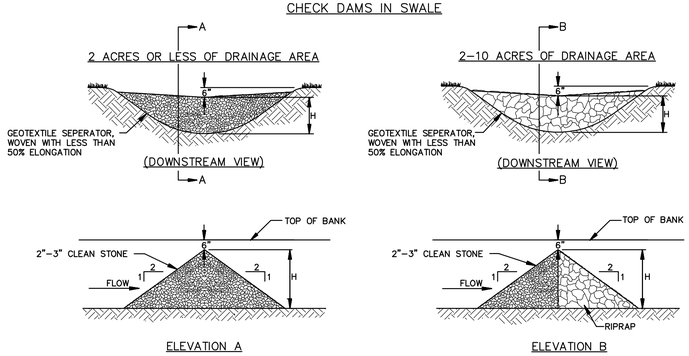
FIELD BOOK INFORMATION:-

NOTE: SEE SITE MAP FOR LOCATION OF CHECK DAM(S).

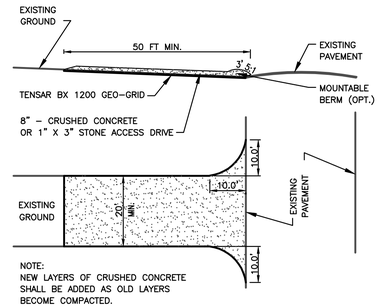


CHECK DAMS IN SWALE



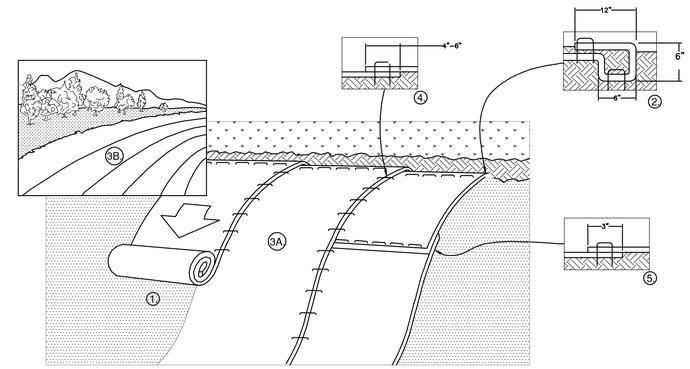
ROCK CHECK DAM

N.T.S.



CONSTRUCTION ENTRANCE

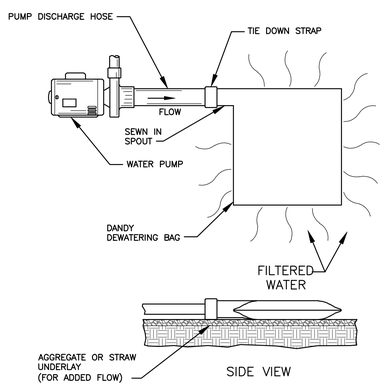
NO SCALE



1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6" DEEP X 6" WIDE TRENCH WITH APPROXIMATELY 12" OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH AS SHOWN IN DETAIL 2. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" APART ACROSS THE WIDTH OF THE BLANKET.
3. ROLL THE BLANKETS (A.) DOWN OR (B.) HORIZONTALLY ACROSS THE SLOPE. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS PER MANUFACTURES RECOMMENDATION.
4. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH MINIMUM 6" OVERLAP. TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE SEAM STITCH ON THE PREVIOUSLY INSTALLED BLANKET.
5. CONSECUTIVE BLANKETS SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" APART ACROSS ENTIRE BLANKET WIDTH.
6. PLACE STAPLES/STAKES PER MANUFACTURER'S RECOMMENDATION FOR THE APPROPRIATE SLOPE BEING APPLIED.

NOTES:
1. IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" MAY BE NECESSARY TO PROPERLY SECURE THE BLANKETS.
2. FOLLOW EROSION CONTROL TECHNOLOGY COUNCIL SPECIFICATION FOR PRODUCT SELECTION.

EROSION CONTROL BLANKET
(SLOPE INSTALLATION)



Mechanical Properties	Test Method	Units	MARV
Grab Tensile Strength	ASTM D 4632	kN (lbs)	0.9 (205) x 0.9 (205)
Grab Tensile Elongation	ASTM D 4632	%	50 x 50
Puncture Strength	ASTM D 4833	kN (lbs)	0.58 (130)
Mullen Burst Strength	ASTM D 3786	kPa (psi)	2618 (380)
Trapezoid Tear Strength	ASTM D 4533	kN (lbs)	0.36 (80) X 0.36 (80)
UV Resistence	ASTM D 4355	%	70
Apparent Opening Size	ASTM D 4751	Mm (US Std Sieve)	0.180 (80)
Flow Rate	ASTM D 4491	1/min/m² (gal/min/ft)	3866 (95)
Permittivity	ASTM D 4491	Sec⁻¹	1.2

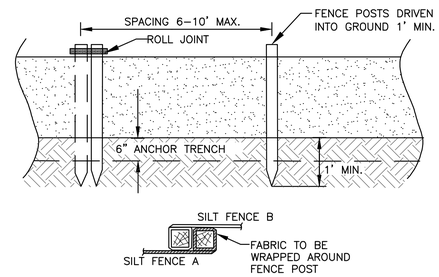
DANDY DEWATERING BAG™
SPECIFICATIONS

NOTE: THE DANDY DEWATERING BAG™ WILL BE **MANUFACTURED IN THE U.S.A.** FROM A NONWOVEN POLYPROPYLENE FABRIC THAT MEETS OR EXCEEDS THE FOLLOWING SPECIFICATIONS:

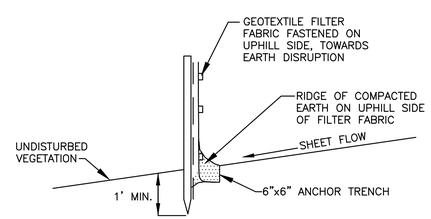
DEWATERING BAG

NOT TO SCALE

NOTE:
IF DEWATERING IS REQUIRED. ALL GROUNDWATER SHALL PASS THROUGH A DEWATERING BAG PRIOR TO BEING RELEASED INTO THE PUBLIC STORM SEWER SYSTEM.



ROLL JOINTS



SILT FENCE

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FAX 989.732.8085
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ANIMAL CONTROL BUILDING
LIVINGSTON TOWNSHIP, OTSEGO COUNTY, MICHIGAN
SWPP DETAILS PLAN

ISSUED FOR:	DATE:	BY:
APPROVALS	011111	JRC
APPROVALS	021611	JRC
BID	040511	JRC

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APE2019.01G

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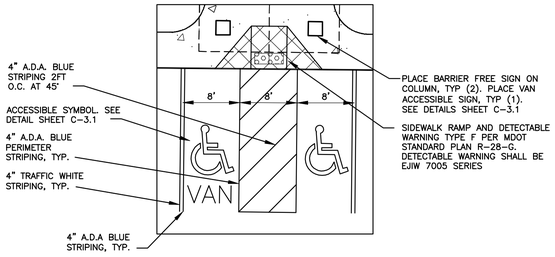
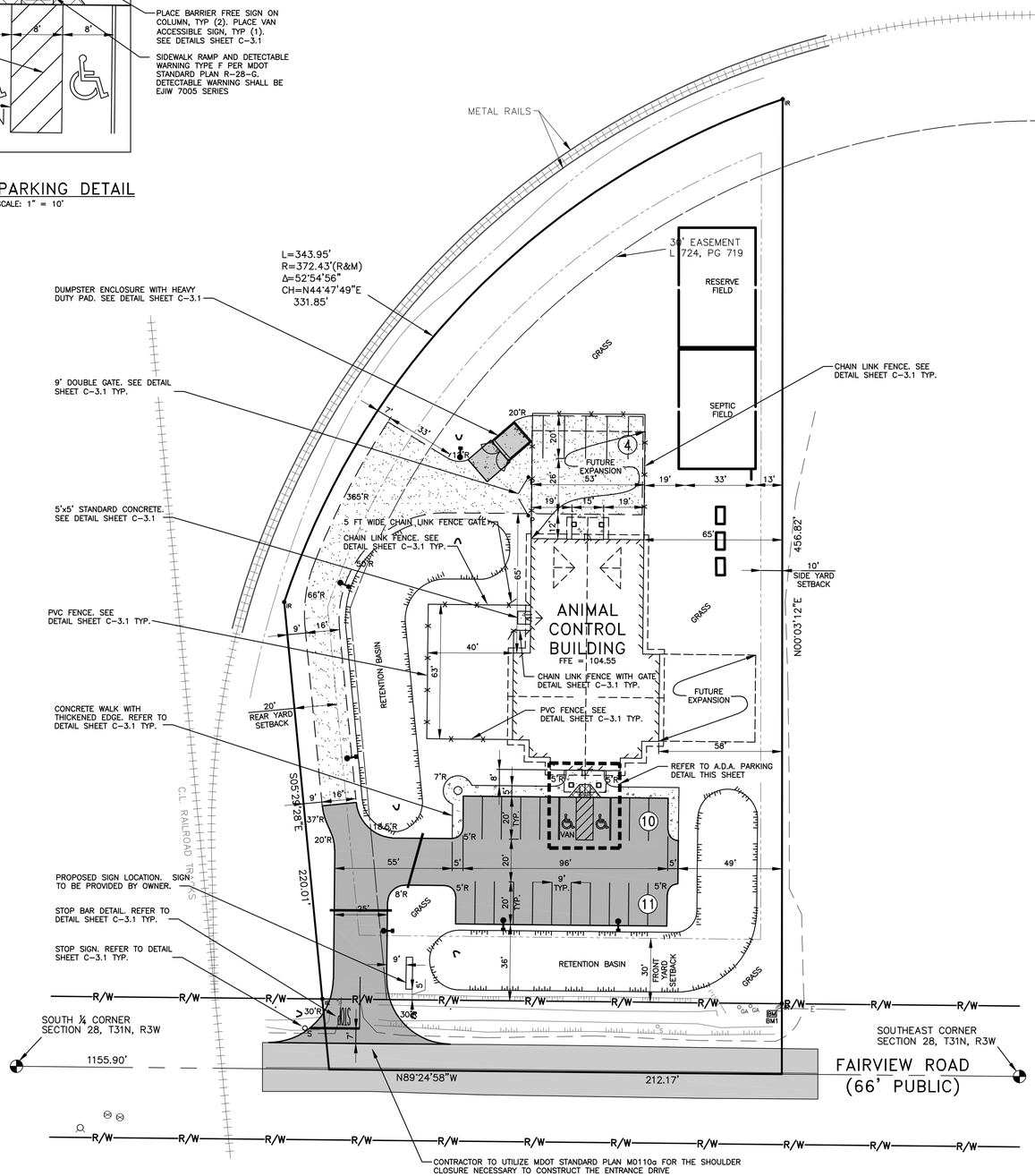


A.D.A. PARKING DETAIL

SCALE: 1" = 10'



SITE PLAN NOTES

1. ALL WORK AND MATERIALS SHALL COMPLY WITH ALL TOWNSHIP/CITY/COUNTY REGULATIONS AND CODES AND O.S.H.A. STANDARDS.
2. CONTRACTOR SHALL REFER TO THE ARCHITECTURAL PLANS FOR EXACT LOCATIONS AND DIMENSIONS OF VESTIBULES, SLOPE PAVING, SIDEWALKS, EXIT PORCHES, TRUCK DOCKS, PRECISE BUILDING DIMENSIONS AND EXACT BUILDING UTILITY ENTRANCE LOCATIONS.
3. ALL DISTURBED AREAS TO RECEIVE FOUR INCHES OF TOPSOIL, SEED, MULCH AND WATER UNTIL A HEALTHY STAND OF GRASS IS ESTABLISHED.
4. 18" WIDE SOD STRIP IS REQUIRED BEHIND ALL CONCRETE CURBS.
5. ALL DIMENSIONS AND RADII ARE TO THE **FACE** OF CURB OR EDGE OF PAVEMENT UNLESS OTHERWISE NOTED.
6. EXISTING STRUCTURES WITHIN CONSTRUCTION LIMITS ARE TO BE ABANDONED, REMOVED OR RELOCATED AS NECESSARY. ALL COST SHALL BE INCLUDED IN BASE BID.
7. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL RELOCATIONS, (UNLESS OTHERWISE NOTED ON PLANS) INCLUDING BUT NOT LIMITED TO, ALL UTILITIES, STORM DRAINAGE, SIGNS, TRAFFIC SIGNALS & POLES, ETC. AS REQUIRED. ALL WORK SHALL BE IN ACCORDANCE WITH GOVERNING AUTHORITIES REQUIREMENTS AND PROJECT SITEWORK SPECIFICATIONS AND SHALL BE APPROVED BY SUCH. ALL COST SHALL BE INCLUDED IN BASE BID.
8. SITE TOPOGRAPHY, UTILITY AND ROAD INFORMATION TAKEN FROM A SURVEY BY WADE TRIM.
9. SITE LIGHTING SHALL BE DEFLECTED AS NOT TO BE DIRECTED ON ADJACENT PROPERTY. REFER TO ELECTRICAL DRAWINGS FOR SITE LIGHTING CIRCUITRY AND LIGHT POLE LOCATIONS.
10. THE SITE CONTRACTOR SHALL COORDINATE HIS WORK WITH THE BUILDING CONTRACTOR.
11. ALL PARKING LOT STRIPING SHALL BE IN ACCORDANCE WITH THE "MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES". ALL STRIPING SHALL BE WATERBORNE AND ALL STRIPING SHALL BE 4" TRAFFIC WHITE UNLESS OTHERWISE NOTED. DIAGONAL STRIPING SHALL BE 4" TRAFFIC WHITE AT 2 FT ON CENTER AT A 45° ANGLE.
12. CONTRACTOR IS RESPONSIBLE FOR PROPER TRAFFIC CONTROL DURING CONSTRUCTION IN ACCORDANCE WITH THE "MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES".
13. ALL BARRIER FREE PARKING, SIGNAGE & STRIPING SHALL BE IN ACCORDANCE WITH MICHIGAN BARRIER FREE STANDARDS. DETECTABLE WARNING SURFACE SHALL BE INSTALLED AS REQ'D BY MICHIGAN BARRIER FREE STANDARDS AT ALL RAMP AND OTHER LOCATIONS AS PROVIDED IN MICHIGAN BARRIER FREE STANDARDS. STRIPING SHALL BE WATERBORNE PAVEMENT MARKING PER MDOT SPECIFICATIONS, COLOR BLUE UNLESS OTHERWISE SPECIFIED.
14. ALL ON-SITE CURBING SHALL BE M.D.O.T. C4 UNLESS OTHERWISE NOTED.
15. PLACEMENT OF SLEEVES FOR ANY ELECTRIC OR IRRIGATION SYSTEM SHALL BE COORDINATED WITH OWNER/ARCHITECT PRIOR TO BEGINNING CONSTRUCTION.

LEGEND

PROPOSED PARKING COUNT	(5)
PROPOSED SIGN	S
LIGHT POLE. REFER TO DETAIL SHEET C-3.1	
PROPOSED PAVEMENT	
PROPOSED BUILDING	
PROPOSED PAVEMENT MARKINGS	
PROPOSED FENCE	
STANDARD ASPHALT PAVEMENT. SEE DETAIL SHEET C-3.1 FOR PAVEMENT SECTIONS	
STANDARD CONCRETE. SEE DETAIL SHEET C-3.1 FOR PAVEMENT SECTION.	
HEAVY DUTY CONCRETE. SEE DETAIL SHEET C-3.1 FOR PAVEMENT SECTION.	
AGGREGATE SURFACE. SEE DETAIL SHEET C-3.1 FOR GRAVEL SECTION.	

SITE DATA TABLE

PARKING CALCULATIONS		
USE	AREA	REQUIREMENT
KENNEL/OFFICE	6,235 SF	1 SPACE PER 800 SF = 8 SPACES
	TOTAL REQUIRED	8
	TOTAL PROVIDED	25
ZONING		
CURRENT ZONING		B3 - LIGHT MANUFACTURING
BUILDING SETBACKS		
	FRONT YARD	30 FT
	REAR YARD	20 FT
	SIDE YARD	10 FT
PARKING SETBACKS		
	FRONT YARD	10 FT
	REAR YARD	10 FT
	SIDE YARD	10 FT

BID PLANS NOT FOR CONSTRUCTION

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LIVINGSTON TOWNSHIP, OTSEGO COUNTY, MICHIGAN
SITE PLAN

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BID	040511	JRC

JOB NO. APE2019.01G

SHEET C-3.0

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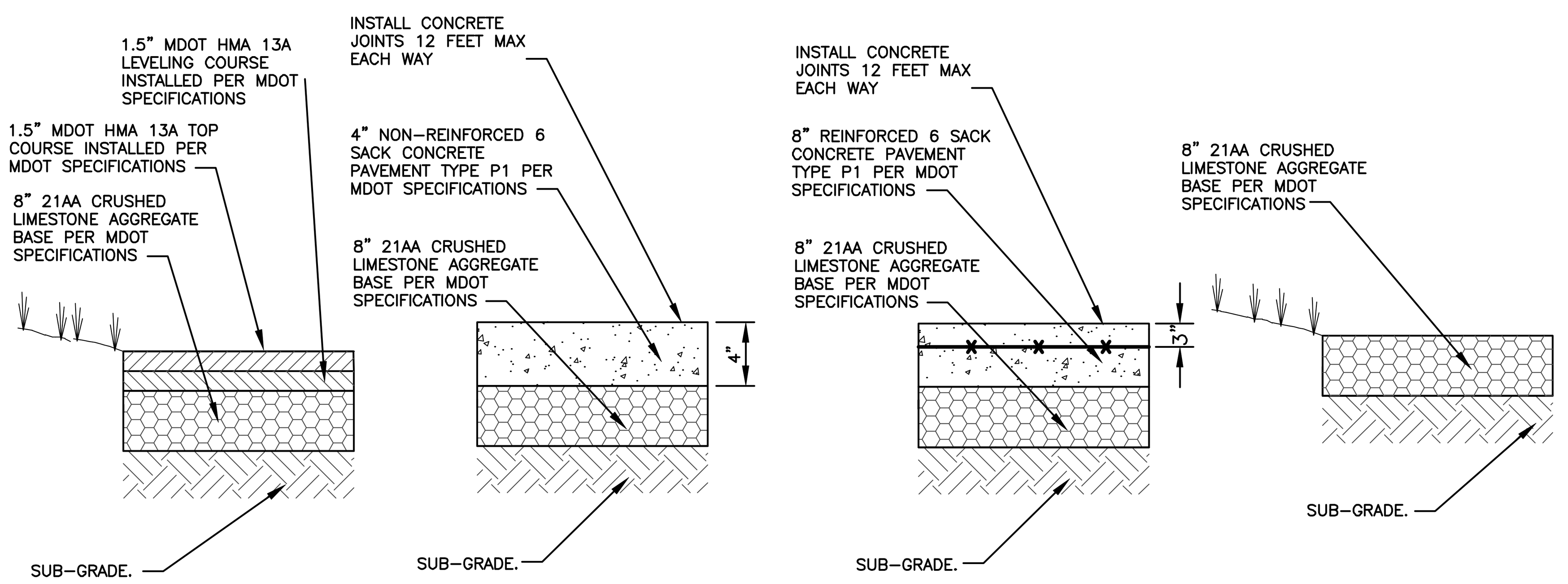
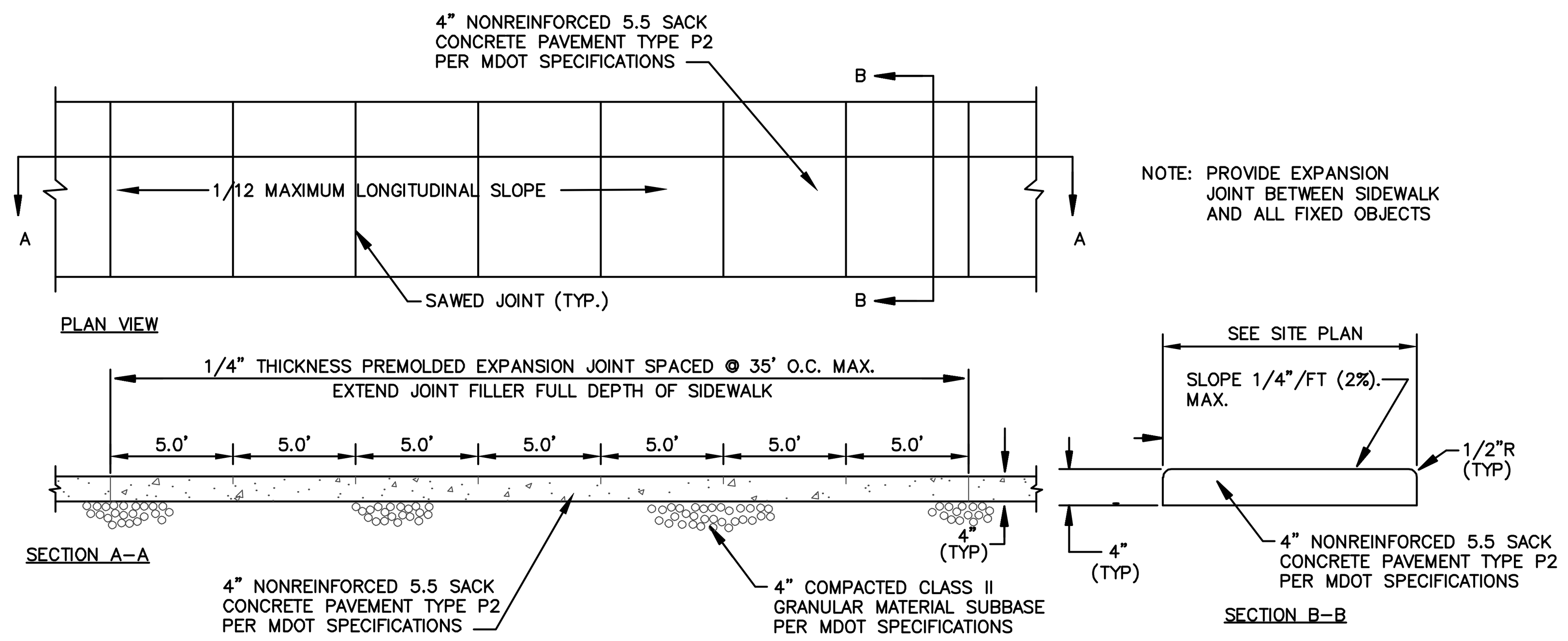


STANDARD DUTY ASPHALT PAVING — STANDARD DUTY CONCRETE PAVING — HEAVY DUTY CONCRETE PAVING — AGGREGATE SURFACE

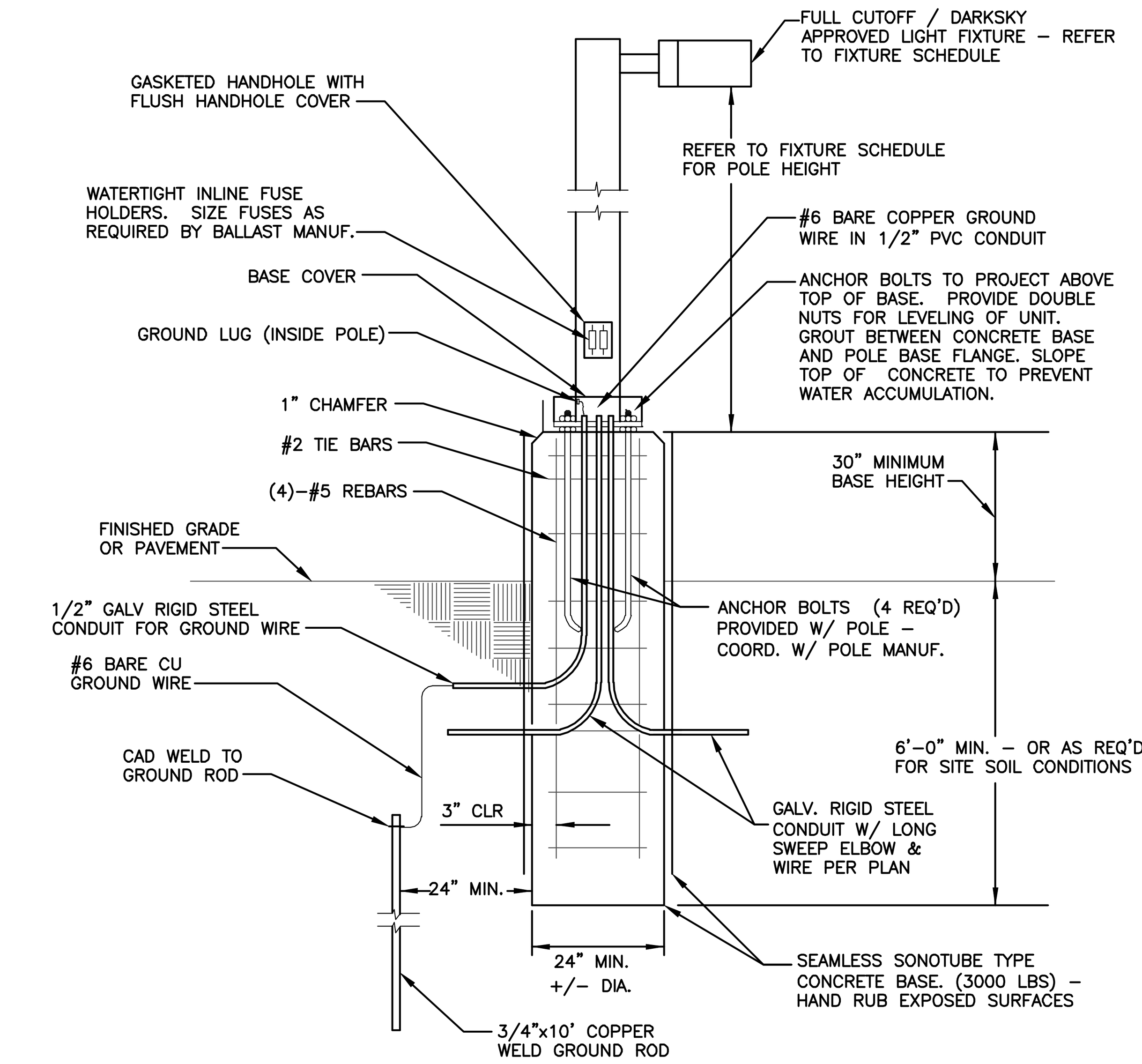
REINFORCEMENT
1. W6 X 6 WELDED WIRE MESH. AT 6 INCHES O.C. WITH MINIMUM 2 FT OVERLAPS. REINFORCEMENT SHALL NOT BE PLACED CLOSER THAN 9" FROM THE EDGE OF PAVEMENT OR THE EDGE OF A FINAL POUR.
2. REINFORCEMENT FABRIC SHALL CONFROM TO ASTM A 185.
3. WIRE FABRIC REINFORCEMENT SHALL LAY FLAT WHEN DELIVERED TO THE WORK AREA. THE USE OF SPACER BARS WILL BE REQUIRED FOR LIFTING BUNDLES OF REINFORCEMENT
4. THE ENDS OF THE WIRE FABRIC REINFORCEMENT SHEETS SHALL BE FASTENED IN AT LEAST TWO PLACES ON EACH END.

PAVING SECTIONS
N.T.S.



NOTE: PROVIDE EXPANSION JOINT BETWEEN SIDEWALK AND ALL FIXED OBJECTS

STANDARD CONCRETE WALK
N.T.S.



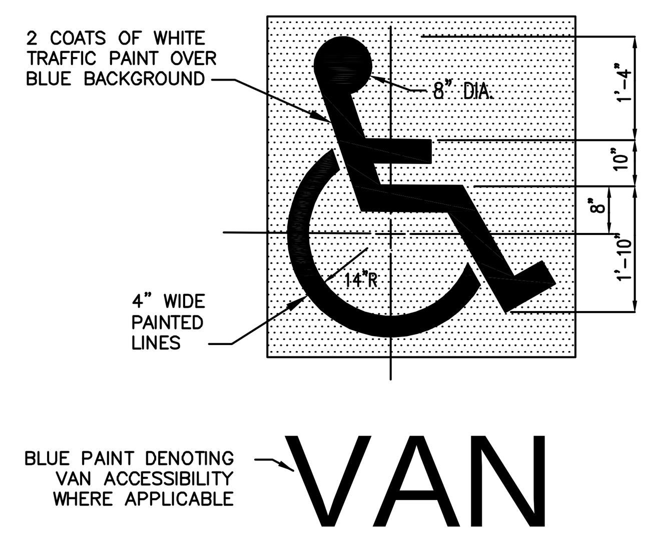
NOTES:

1. ANCHOR BOLTS AND TEMPLATES FURNISHED BY ELECTRICAL CONTRACTOR. UNLESS NOTED OTHERWISE, CONCRETE BASE AND ANCHOR BOLTS INSTALLED BY ELECTRICAL CONTRACTOR.

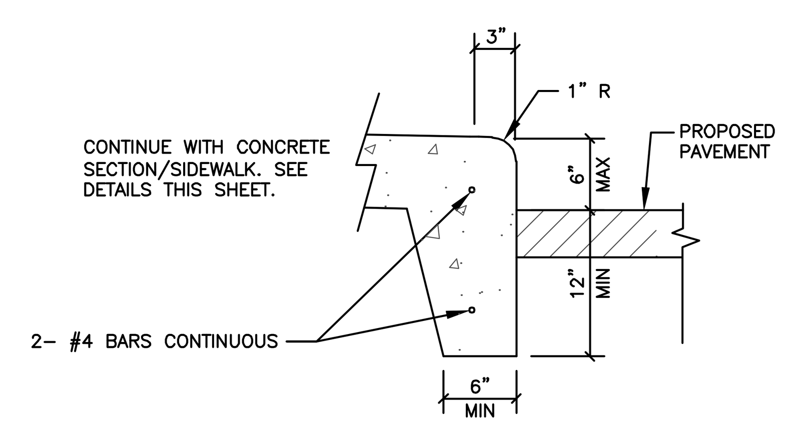
2. BASE SHALL BE 3000 PSI CONCRETE STONED AND SACKED EXPOSED PORTION.

3. STANDARDS TO WITHSTAND WIND LOADS OF 100 MPH MINIMUM.

SITE LIGHTING POLE DETAIL
NO SCALE



ACCESSIBLE SYMBOL
N.T.S.



THICKENED EDGE CONCRETE
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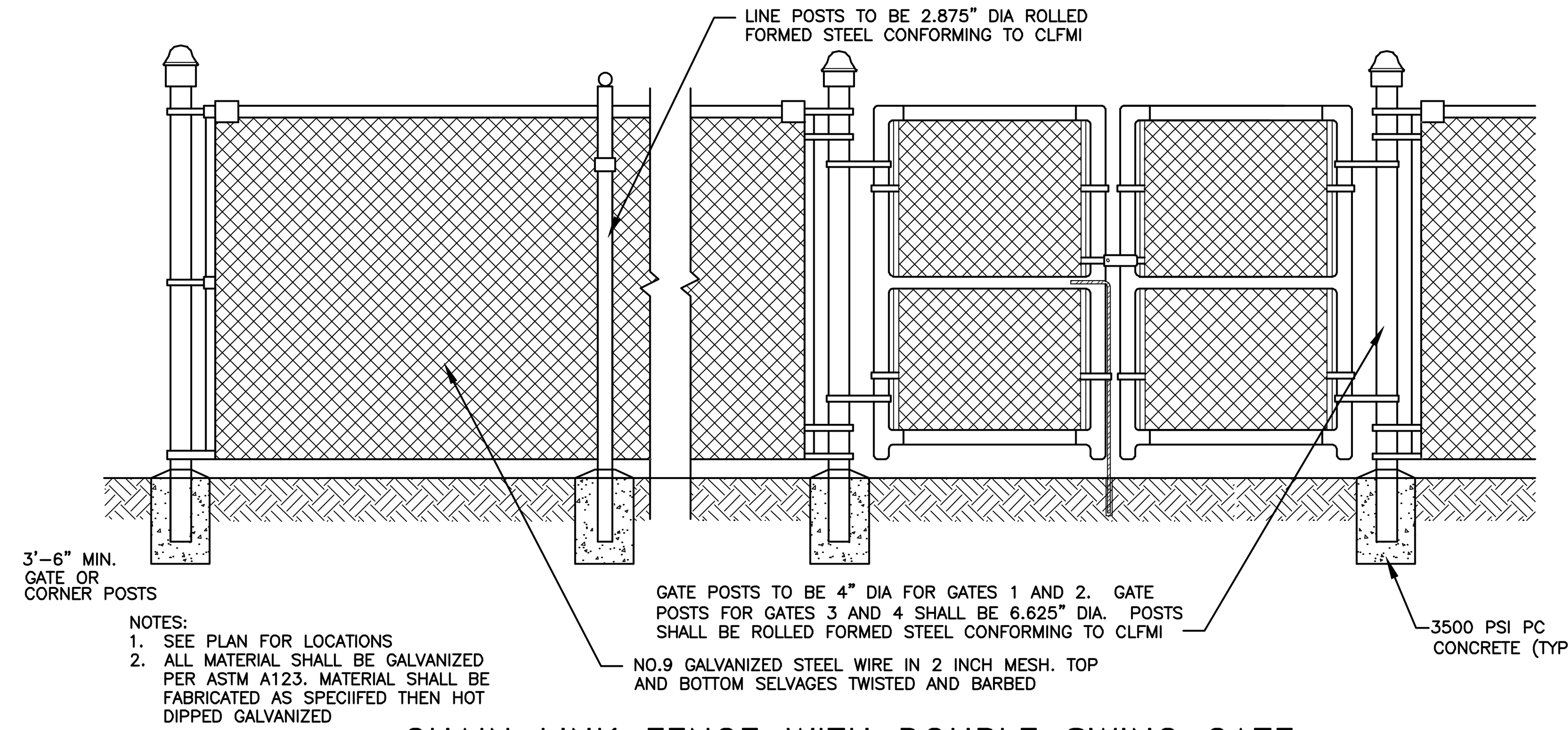
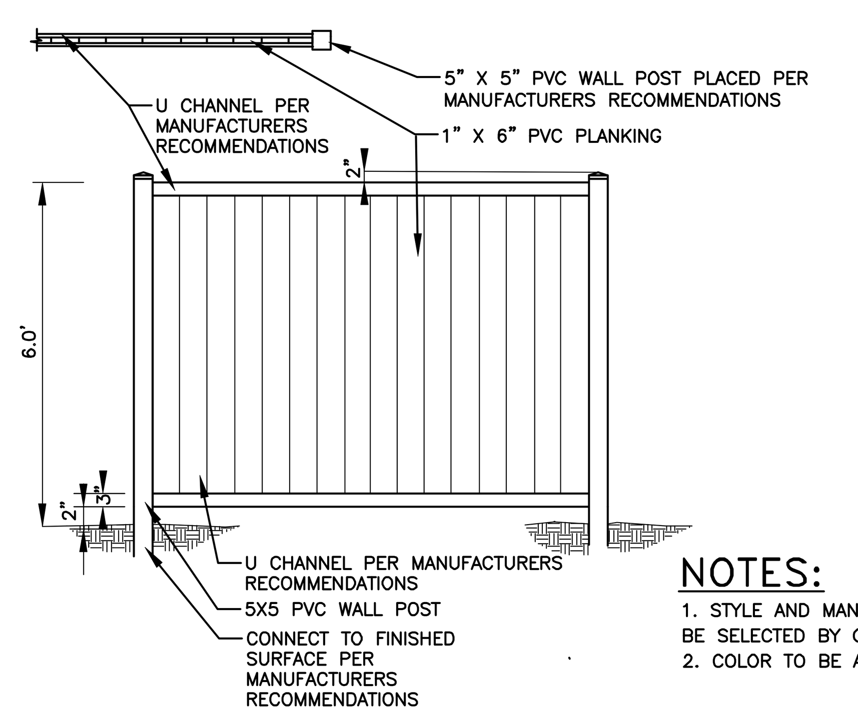


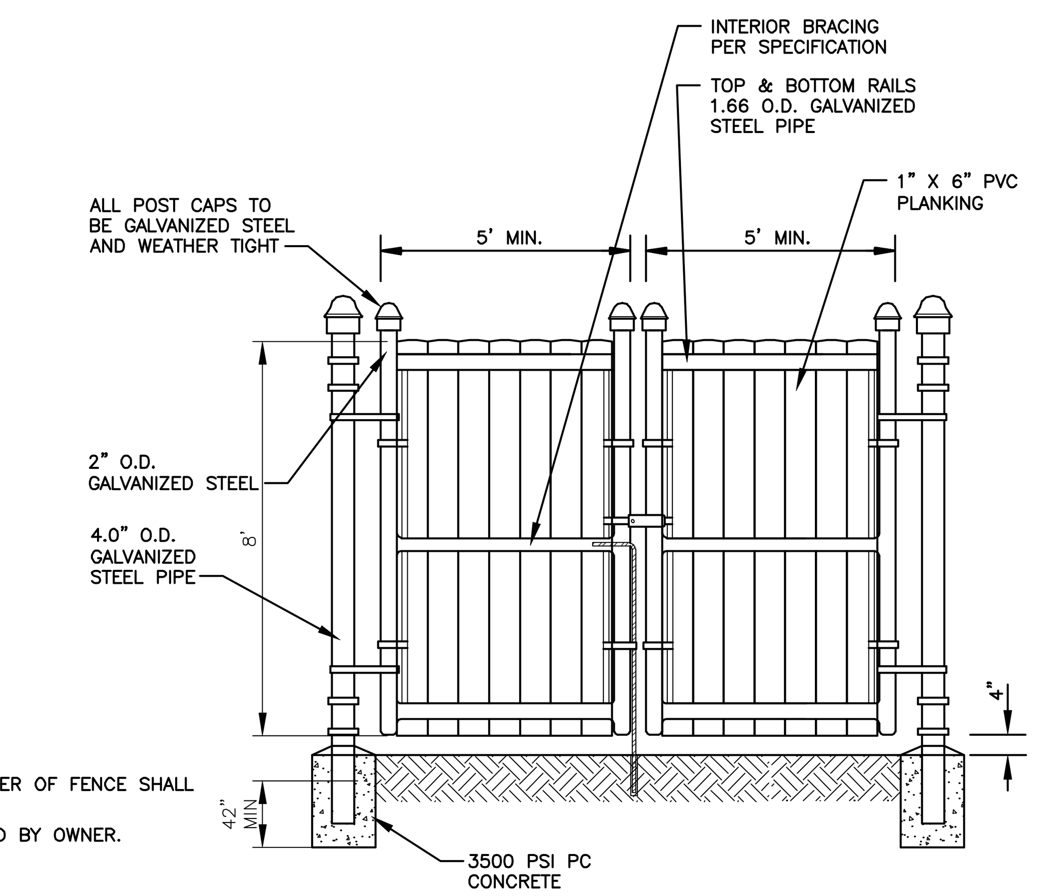
NOTES:
1. SEE PLAN FOR LOCATIONS
2. ALL MATERIAL SHALL BE GALVANIZED PER ASTM A123. MATERIAL SHALL BE FABRICATED AS SPECIIFED THEN HOT DIPPED GALVANIZED

CHAIN LINK FENCE WITH DOUBLE SWING GATE
N.T.S.

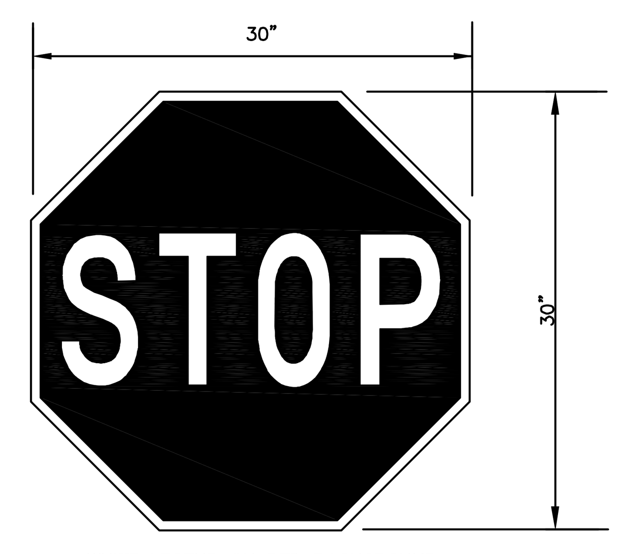


PVC FENCING

NOTES:
1. STYLE AND MANUFACTURER OF FENCE SHALL BE SELECTED BY OWNER
2. COLOR TO BE APPROVED BY OWNER.

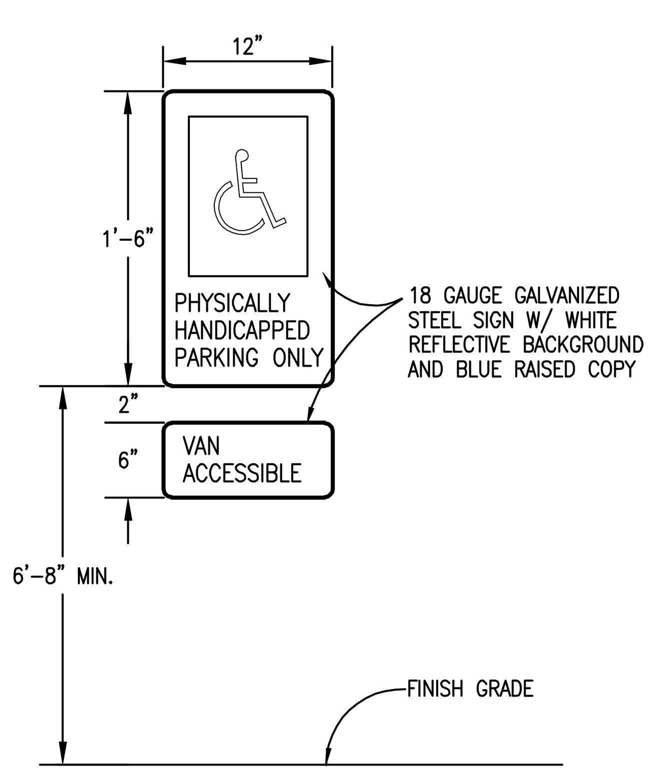


DUMPSTER ENCLOSURE GATE



WHITE LEGEND ON RED BACKGROUND

R1-1
"STOP" SIGN
N.T.S.



ACCESSIBLE PARKING SIGN
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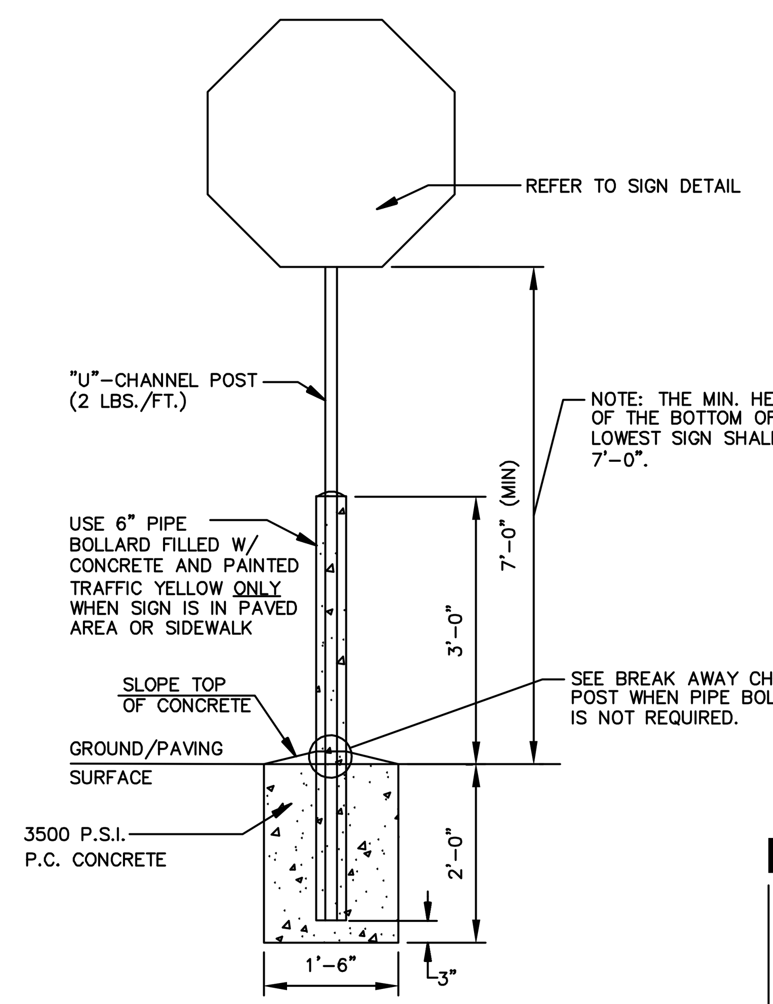
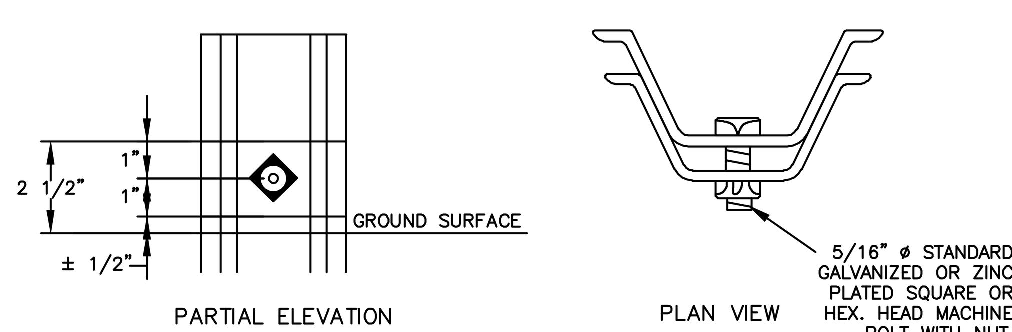


SITE SIGN BASE DETAILS
N.T.S.



BREAK AWAY CHANNEL POST
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Know what's **below.**
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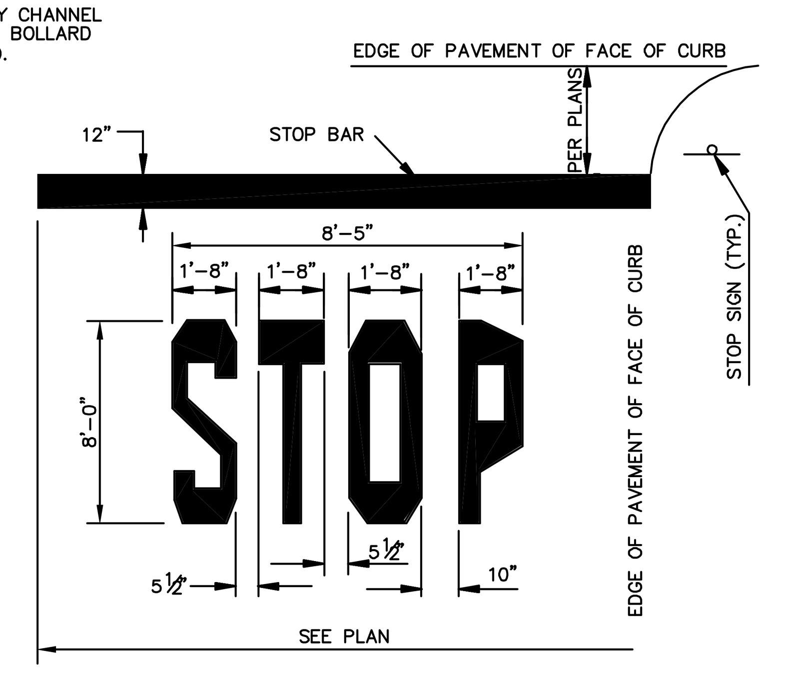
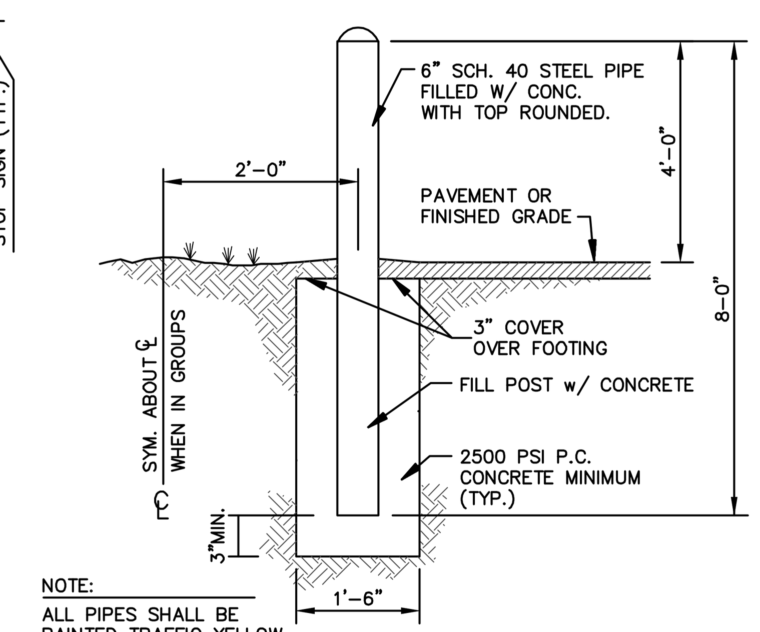


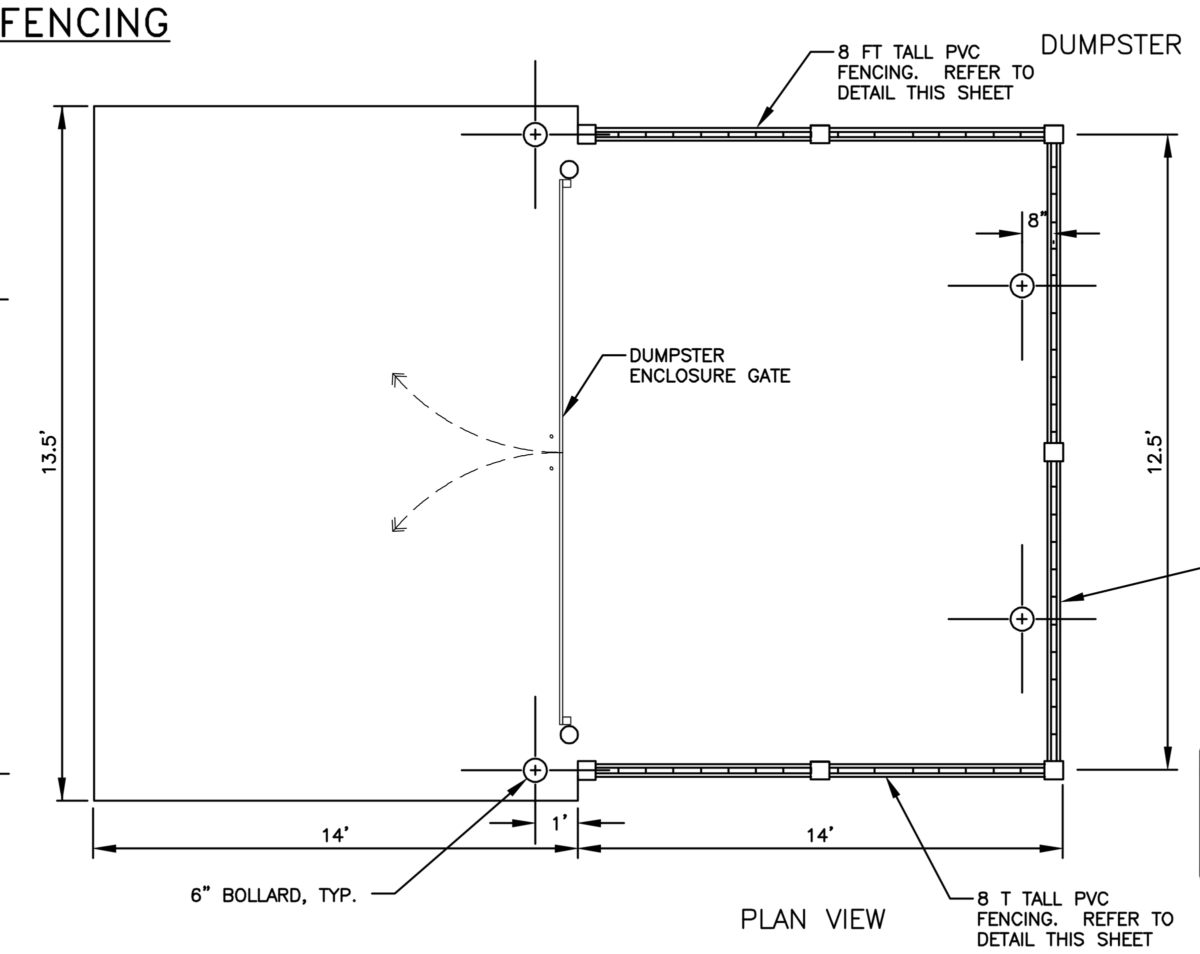
NOTE:
1. WORDS AND ARROWS FOR DRIVEWAYS SHALL BE APPLIED ACCORDING TO REQUIREMENTS AS OUTLINED IN SECTION 3B OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS.
2. THESE WORDS AND BAR ARE TO BE PAINTED REFLECTIVE WHITE.

STOP BAR
N.T.S.



NOTE:
ALL PIPES SHALL BE PAINTED TRAFFIC YELLOW

BOLLARD
N.T.S.



DUMPSTER ENCLOSURE DETAIL

BID PLANS NOT FOR CONSTRUCTION

REV#	DATE	DESCRIPTION	BY

NOT VALID FOR CONSTRUCTION UNLESS SIGNED AND DATED:

WADE TRIM
271 West McCoy Road, P.O. Box 618
Gaylord, MI 49735
989.732.3584/800.968.4440
FAX: 989.732.6391
www.wadetrim.com
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P.O. BOX 479
GAYLORD, MI 49734

ANIMAL CONTROL BUILDING
LIVINGSTON TOWNSHIP, OTSEGO COUNTY, MICHIGAN
SITE DETAILS PLAN

ISSUED FOR:	DATE:	BY:
APPROVALS	011111	JRC
APPROVALS	021611	JRC
BID	040511	JRC

JOB NO. APE2019.01G

SHEET C-3.1

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PROJECT MANAGER:– FIELD BOOK INFORMATION:–
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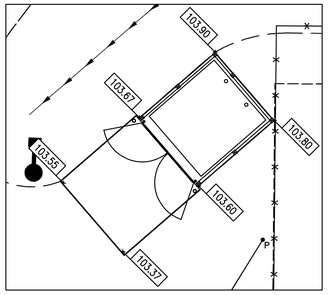
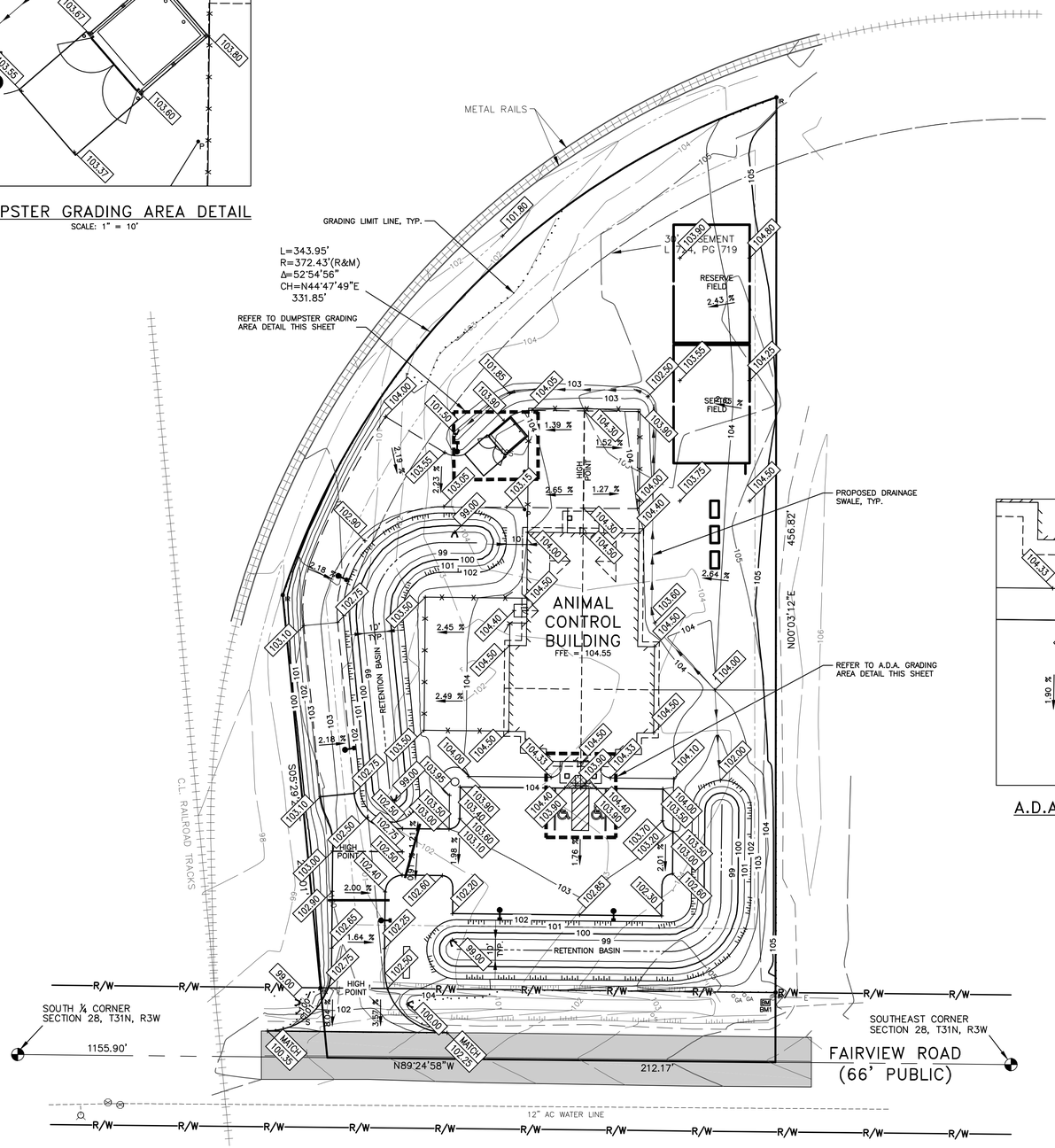
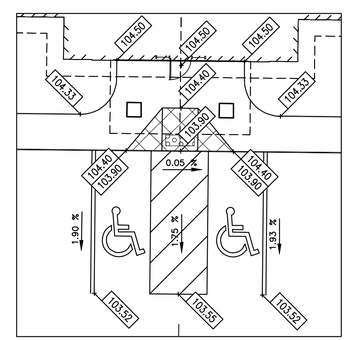


DUMPSTER GRADING AREA DETAIL

SCALE: 1" = 10'





A.D.A. GRADING AREA DETAIL

SCALE: 1" = 10'

LEGEND

FINISH GRADE	1234.56 TOP OF SIDEWALK 1234.56 TOP OF PAVEMENT
FINISH GRADE	1234.56 TOP OF SURFACE
PROPOSED SLOPE	1.21 %
DRAINAGE SWALE	
CENTER OF BASIN	
MINOR CONTOUR	732
MAJOR CONTOUR	735
HIGH POINT	HIGH POINT
GRADING LIMITS	

GRADING NOTES

1. THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES, AND WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE APPROPRIATE UTILITY COMPANIES AT LEAST 72 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATION OF UTILITIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.
2. ALL CUT OR FILL SLOPES SHALL BE 3:1 OR FLATTER UNLESS OTHERWISE NOTED.
3. ALL EXISTING STORM WATER PIPES AND STORM WATER SUMPS DOWNSTREAM OF PROPOSED STORM WATER IMPROVEMENTS SHALL BE CLEANED OUT TO REMOVE ALL SILT AND DEBRIS AT PROJECT COMPLETION.
4. EXISTING GRADE CONTOUR INTERVALS SHOWN AT 1 FOOT INTERVALS
5. PROPOSED GRADE CONTOUR INTERVALS SHOWN AT 1 FOOT INTERVALS.
6. IF ANY EXISTING STRUCTURES TO REMAIN ARE DAMAGED DURING CONSTRUCTION IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO REPAIR AND/OR REPLACE THE EXISTING STRUCTURE AS NECESSARY TO RETURN IT TO EXISTING CONDITIONS OR BETTER.
7. ALL STORM PIPE ENTERING STRUCTURES SHALL BE GROUTED TO ASSURE CONNECTION AT STRUCTURE IS WATERTIGHT.
8. ALL STORM SEWER MANHOLES IN PAVED AREAS SHALL BE FLUSH WITH PAVEMENT, AND SHALL HAVE TRAFFIC BEARING RING & COVERS. MANHOLES IN UNPAVED AREAS SHALL BE 2" ABOVE FINISH GRADE. LIDS SHALL BE LABELED "STORM SEWER".
9. THE CONTRACTOR SHALL ADHERE TO ALL TERMS & CONDITIONS AS OUTLINED IN THE SOIL EROSION CONTROL PERMIT.
10. CONTRACTOR SHALL ADJUST AND/OR CUT EXISTING PAVEMENT AS NECESSARY TO ASSURE A SMOOTH FIT AND CONTINUOUS GRADE.
11. CONTRACTOR SHALL ASSURE POSITIVE DRAINAGE AWAY FROM BUILDINGS FOR ALL NATURAL AND PAVED AREAS.
12. TOPOGRAPHIC INFORMATION TAKEN FROM A TOPOGRAPHIC SURVEY BY WADE TRIM, IF CONTRACTOR DOES NOT ACCEPT EXISTING TOPOGRAPHY AS SHOWN ON THE PLANS, WITHOUT EXCEPTION, HE SHALL HAVE MADE, AT HIS EXPENSE, A TOPOGRAPHIC SURVEY BY A REGISTERED LAND SURVEYOR AND SUBMIT IT TO THE OWNER FOR REVIEW.
13. ALL ON-SITE UNPAVED AREAS DISTURBED BY GRADING OPERATION SHALL RECEIVE 4 INCHES OF TOPSOIL, SEES/SOD AND MULCH. TOPSOIL SHALL BE PER ASTM D5268 AND SHALL BE NATURAL, FRIABLE, FERTILE, FINE LOAMY SOIL POSSESSING CHARACTERISTICS OF REPRESENTATIVE TOPSOIL IN THE VICINITY THAT PRODUCES HEAVY GROWTH. TOPSOIL SHALL HAVE A PH RANGE OF 5.5 TO 7.4 PERCENT, FREE FROM SUBSOIL, OBJECTIONABLE WEEDS, LITTER, SODS, STIFF CLAY, STONES LARGER THAN 1-INCH IN DIAMETER, STUMPS, ROOTS, TRASH, TOXIC SUBSTANCES, OR ANY OTHER MATERIAL WHICH MAY BE HARMFUL TO PLANT GROWTH OR HINDER PLANTING OPERATIONS. TOP SOIL SHALL CONTAIN A MINIMUM OF THREE PERCENT ORGANIC MATERIAL. IF EXISTING ONSITE TOPSOIL OR IMPORTED TOPSOIL DOES NOT MEET THESE REQUIREMENTS, THE TOPSOIL SHALL BE CONDITIONED UNTIL REQUIREMENTS ARE MET.
14. CONTRACTOR SHALL APPLY STABILIZATION FABRIC TO ALL SLOPES 3H:1V OR STEEPER. CONTRACTOR SHALL STABILIZE DISTURBED AREAS IN ACCORDANCE WITH GOVERNING SPECIFICATIONS UNTIL A HEALTHY STAND OF VEGETATION IS OBTAINED.
15. CONSTRUCTION SHALL COMPLY WITH ALL APPLICABLE GOVERNING CODES AND BE CONSTRUCTED TO SAME.
16. CONTOURS ARE FOR INFORMATION ONLY. USE SPOT GRADES FOR CONSTRUCTION.

BID PLANS
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CONSTRUCTION

30 15 0 30 60
SCALE IN FEET

Know what's **below.**
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APPROVALS	011111	JRC
APPROVALS	021611	JRC
BID	040511	JRC

JOB NO. APE2019.01G

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PROJECT MANAGER:-
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FIELD BOOK INFORMATION:-

GRADING NOTES

MATERIAL

THE GRANULAR MATERIAL GRADATION SHALL CONFORM TO THE GRADING REQUIREMENTS FOR GRANULAR MATERIAL CLASS II AS SPECIFIED IN MDOT, SECTION 902.08.

AGGREGATE MATERIALS, USED FOR UNDERCUT BACKFILL SHALL BE CRUSHED LIMESTONE, NATURAL AGGREGATE, BLAST FURNACE SLAG, OR CRUSHED CONCRETE, MEETING THE REQUIREMENTS OF 21AA, 21A OR 22A AS SPECIFIED IN MDOT SECTION 902.06.

CRUSHED CONCRETE SHALL BE FREE OF ALL STEEL AND OTHER DELETERIOUS MATERIALS.

SUBGRADE STABILIZATION FABRIC SHALL BE COMPOSED OF SYNTHETIC FIBERS FORMED INTO A WOVEN FABRIC. THE FIBERS SHALL BE COMPOSED OF 85% PROPYLENE OR ESTER POLYMERS. THE GEOTEXTILE SHALL CONFORM TO THE FOLLOWING REQUIREMENTS LISTED BELOW:

PROPERTY	TEST PROCEDURE	TEST RESULT
GRAB TENSILE	ASTM D4632	270 LBS. (MIN)
ELONGATIOn	ASTM D4632	15% (MIN)
TRAPEZOIDAL TEAR	ASTM D4533	100 LBS. (MIN)
PUNCTURE	ASTM D4833	100 LBS. (MIN)
AOS	ASTM D4751	40–70 U.S. SIEVE
PERMITTIVITY	ASTM D4491	0.05 PER SEC (MIN)
MULLEN BURST	ASTM D3786	400 PSI (MIN)

PREPARING SUBGRADE

ALL MUCK, PEAT AND OTHER UNSUITABLE MATERIAL WITHIN THE SUBGRADE SHALL BE REMOVED, DISPLACED OR OTHERWISE TREATED, AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. ALL DEPOSITS OF FROST HEAVE MATERIAL WITHIN LINES TWO (2) FEET OUTSIDE THE PROPOSED PAVEMENT AREA SHALL BE REMOVED TO A DEPTH OF THREE (3) FEET BELOW THE SURFACE OF THE EARTH GRADE, UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DETERMINED BY THE ENGINEER. ALL ICE AND SNOW SHALL BE REMOVED FROM THE SURFACE OF THE GROUND BEFORE THE EMBANKMENT IS PLACED.

ALL MUCK, PEAT, FROST HEAVE MATERIAL AND OTHER UNSUITABLE MATERIAL SHALL BE DISPOSED OF PROPERLY OR SHALL BE SPREAD UNIFORMLY IN LOW PLACES BEYOND THE PAVEMENT LIMITS WHEN SO APPROVED BY THE ENGINEER.

OLD ROAD SURFACING OR GRAVEL, CRUSHED STONE, OR OTHER NONRIGID TYPE SURFACING, OCCURRING WITHIN THE AREA OF THE PAVEMENT AND UNDERLYING PROPOSED EMBANKMENT LESS THAN 1–FOOT IN DEPTH, AND WHICH IS NOT TO BE SALVAGED AND INCORPORATED IN THE NEW WORK, SHALL BE PLOWED OR SCARIFIED FULL DEPTH, SPREAD AND COMPACTED TO FORM A UNIFORM FOUNDATION, BEFORE ANY NEW EMBANKMENT IS PLACED.

OLD PAVEMENT, AND OTHER RIGID STRUCTURES, OCCURRING WITHIN THE AREA OF THE PAVEMENT AND UNDERLYING THE PROPOSED EMBANKMENT LESS THAN 1–FOOT IN DEPTH AND WHICH ARE NOT TO BE INCORPORATED INTO THE NEW WORK, SHALL BE BROKEN UP AND REMOVED.

RUBBLE, CONCRETE DEBRIS, AND OTHER DELETERIOUS MATERIALS OCCURING WITHIN THE AREA OF THE PAVEMENT SHALL BE BROKEN UP AND REMOVED TO NATIVE SOILS.

SUBGRADE

THE AREA TO BE PAVED SHALL BE EXCAVATED AND SMOOTHED TO THE LINE, GRADE AND CROSS SECTION AS INDICATED ON THE PLANS.

THE SUBGRADE BETWEEN THE LINES TWO (2) FEET ON EITHER SIDE OF THE PROPOSED EDGE OF PAVEMENT OR CURB SHALL BE COMPACTED TO 95% OF THE MAXIMUM UNIT WEIGHT FOR A DEPTH OF SEVEN (7) INCHES, BY ROLLING WITH A ROLLER WEIGHTING NOT LESS THAN TEN (10) TONS.

THE SUBGRADE SHALL BE COMPLETED AHEAD OF PLACING FORMS OR PAVING A DISTANCE EQUAL TO THE DISTANCE OF ONE DAY'S AVERAGE PAVING OPERATION. PRIOR TO THE PAVING OPERATION, THE SUBGRADE SHALL BE SHAPED AND COMPACTED TO THE PLAN CROSS SECTION BY APPROVED MECHANICAL MEANS.

PAVEMENT EXCAVATION

PAVEMENT EXCAVATION SHALL CONSIST OF ALL WORK REQUIRED TO CONSTRUCT THE EARTH GRADE AND ITS APPURTENCES TRUE TO THE LINES, GRADES, AND CROSS SECTIONS CALLED FOR ON THE PLANS. EXCAVATION SHALL CONSIST OF THE FOLLOWING ITEMS, ANY OF WHICH OR ALL OF WHICH MAY BE INCLUDED OR INCIDENTAL TO IT; REMOVING TREES, STUMPS, HEDGES, ROOTS, CULVERTS, SEWERS, MISCELLANEOUS STRUCTURES, EXCAVATION, REMOVING OF ALL ASPHALT OR CONCRETE PAVEMENTS, CONCRETE DEBRIS, CURBS, CURB AND GUTTERS, SIDEWALKS, END HEADERS, REMOVING AGGREGATE SURFACES, SALVAGING AND STOCKPILING TOPSOIL, SUBGRADE UNDERCUT, EXCAVATION FOR STRUCTURES, TRIMMING AND FINISHING EARTH GRADE, FINE GRADING, RIGHT–OF–WAY DITCHING AND RESTORATION, AND THE DISPOSAL OF ALL UNSUITABLE MATERIAL OR UNUSED EXCESS MATERIAL.

ALL LARGE STONES, TREES, STUMPS, BRUSH, SHRUBS, LOGS, MATTED ROOTS, OTHER VEGETATION AND DEBRIS OCCURRING BETWEEN LINES THREE (3) FEET OUTSIDE THE GRADING LIMITS OR AS OTHERWISE SHOWN ON THE PLANS SHALL BE COMPLETELY REMOVED AND PROPERLY DISPOSED OF.

ALL EARTH AND OTHER EXISTING MATERIALS SHALL BE EXCAVATED FOR THE FULL DEPTH AND WIDTH OF THE CROSS SECTION A SHOWN ON THE PLANS.

EXCESS OR UNSUITABLE EXCAVATED MATERIAL SHALL BE REMOVED FROM THE PROJECT BY THE CONTRACTOR ALONG APPROVED ROUTES TO DISPOSAL SITES APPROVED BY THE OWNER. DISPOSAL OF EXCESS EXCAVATION AND MAINTENANCE OF THE DUMP SITES SHALL BE CONSIDERED INCIDENTAL.

EMBANKMENTS

EMBANKMENTS SHALL BE CONSTRUCTED WITH SOUND EARTH. THE MATERIALS SHALL BE DEPOSITED AND COMPACTED BY EITHER THE TWELVE INCH LAYER METHOD, OR THE CONTROLLED DENSITY METHOD. THE CONTROLLED DENSITY METHOD WILL BE REQUIRED UNLESS THE TWELVE INCH LAYER METHOD OR SOME OTHER METHOD IS SPECIFICALLY CALLED FOR ON THE PLANS.

THE TOPSOIL SHALL BE STRIPPED FROM THE ENTIRE FILL AREA. AFTER THE TOPSOIL IS REMOVED, THE ENTIRE AREA UPON WHICH THE EMBANKMENT IS TO BE CONSTRUCTED SHALL BE COMPACTED TO NOT LESS THAN 90% OF THE MAXIMUM UNIT WEIGHT, TO A DEPTH OF NINE (9) INCHES.

WHERE STONES ARE PREVALENT, THE MATERIAL SHALL BE CAREFULLY PLACED SO THAT ALL LARGE STONES WILL BE WELL DISTRIBUTED AND THE CREVICES COMPLETELY FILLED WITH SMALLER STONES, EARTH, SAND OR GRAVEL SO AS TO FORM A SOLID EMBANKMENT. ANY ROCK OR FRAGMENTAL MATERIAL OF SUCH SIZE AS WOULD PROHIBIT IT FROM BEING PLACED IN LAYERS OF THE SPECIFIED DEPTH SHALL NOT BE PLACED IN THE EMBANKMENT. IN NO CASE SHALL STONES OVER THREE (3) INCHES (75) IN DIAMETER BE PLACED WITHIN 12 INCHES (300MM) OF THE SURFACE OF THE EARTH GRADE WITHIN THE AREAS BETWEEN LINES TWO (2) FEET OUTSIDE OF THE EDGES OF PROPOSED PAVEMENT.

FROZEN MATERIAL SHALL NOT BE PLACED IN THE EMBANKMENT NOR SHALL EMBANKMENT BE PLACED UPON FROZEN MATERIAL.

THE CONSTRUCTION REQUIREMENTS FOR THE TWO (2) METHODS OF PLACING AND COMPACTING EMBANKMENTS ARE AS FOLLOWS:

A. TWELVE–INCH LAYER METHOD

THE MATERIAL SHALL BE DEPOSITED AND SPREAD IN LAYERS NOT MORE THAN 12 INCHES IN DEPTH, LOOSE MEASURE, PARALLEL TO THE FINISHED GRADE AND EXTENDING TO THE FULL WIDTH OF THE EMBANKMENT. THE MATERIAL SHALL BE DEPOSITED BY OPERATING THE CONVEYING EQUIPMENT OVER THE LAYER BEING PLACED, INSOFAR AS FEASIBLE.

EACH LAYER SHALL BE COMPACTED TO NOT LESS THAN 95% OF THE MAXIMUM UNIT WEIGHT AS DETERMINED AT THE EXISTING MOISTURE CONTENT. THE OPERATION OF COMPACTING SHALL BE CONTINUED UNTIL EACH LAYER IS COMPACTED TO THE REQUIRED DENSITY FOR ITS FULL WIDTH.

B. CONTROLLED DENSITY METHOD

THE MATERIAL FOR THE EMBANKMENT SHALL BE DEPOSITED AND SPREAD IN LAYERS NOT MORE THAN NINE (9) INCHES IN DEPTH, LOOSE MEASURE, AND EXTENDING TO THE FULL WIDTH OF THE EMBANKMENT, EXCEPT THAT GRANULAR MATERIAL MAY BE SPREAD AND COMPACTED IN LAYERS NOT MORE THAN 15 INCHES IN THICKNESS IF THE SPECIFIED DENSITY IS OBTAINED.

THE MATERIAL FOR EMBANKMENTS OF FIVE (5) FEET OR LESS AND THE BOTTOM FOUR (4) FEET OF EMBANKMENTS OF MORE THAN FOUR (4) FEET (1.2 M) ABOVE THE SURFACE OF THE GROUND UPON WHICH THE EMBANKMENT IS TO BE CONSTRUCTED SHALL HAVE NOT MORE THAN THE OPTIMUM MOISTURE CONTENT AT THE TIME OF COMPACTION.

THE MATERIAL FOR THAT PART OF THE EMBANKMENT MORE THAN FIVE (5) FEET ABOVE THE SURFACE OF THE GROUND UPON WHICH THE EMBANKMENT IS TO BE CONSTRUCTED SHALL HAVE A MOISTURE CONTENT OF NOT GREATER THAN THREE (3) PERCENT ABOVE OPTIMUM AT THE TIME OF COMPACTION, EXCEPT THAT THE MOISTURE CONTENT OF THE TOP THREE FEET OF THE EMBANKMENT SHALL NOT EXCEED OPTIMUM. IF GRANULAR MATERIAL IS USED TO CONSTRUCT THE EMBANKMENT, IT SHALL BE AT A MOISTURE CONTENT BELOW SATURATION.

IF THE MATERIAL CONTAINS AN EXCESS OF MOISTURE, IT SHALL BE DRIED TO THE REQUIRED MOISTURE CONTENT BEFORE BEING COMPACTED.

EACH LAYER OF MATERIAL CONTAINING THE REQUIRED AMOUNT OF MOISTURE SHALL BE COMPACTED TO NOT LESS THAN 95% OF ITS MAXIMUM UNIT WEIGHT, UNLESS OTHERWISE SPECIFIED, BEFORE THE SUCCEEDING LAYER IS STARTED.

WHEN THE ORIGINAL GROUND UPON WHICH THE EMBANKMENT IS BEING PLACED, OR ANY SECTION OF COMPACTED EMBANKMENT, OR THE SOIL IN CUT SECTIONS BECOMES RUTTED OR DISTORTED BY THE CONTRACTOR'S EQUIPMENT, THE METHOD OF OPERATION SHALL BE CHANGED TO ELIMINATE THIS CONDITION. THE CONTRACTOR SHALL RESHAPE AND RECOMPACT ANY AREAS SO RUTTED OR DISTORTED AT HIS OWN EXPENSE. THIS SHALL BE DONE BEFORE ANY SUCCEEDING LAYERS ARE PLACED.

ROUGH GRADING

CONTRACTOR SHALL ROUGH GRADE AS CLOSE AS POSSIBLE TO FINISHED SUBGRADE LEAVING A MINIMUM TO BE REMOVED IN FINE GRADING.

DURING THE EXCAVATION OPERATION, INCLUDING THE PLACING OF THE SUBBASE, THE WORK AREA SHALL BE KEPT FREE OF WATER. A DEWATERING SYSTEM SHALL BE PROVIDED AND MAINTAINED BY THE CONTRACTOR AT HIS EXPENSE. THE DEWATERING SYSTEM SHALL REMAIN IN OPERATION UNTIL THE PAVING IS COMPLETED.

PROOF ROLLING

AFTER REMOVAL OF TOPSOIL OR OTHER OVERBURDEN AND AFTER CONSTRUCTION OF EMBANKMENTS, PROOF ROLL THE EXISTING SUBGRADE WITH SIX PASSES OF A MINIMUM 15 TON PNEUMATIC–TIRED ROLLER. OPERATE THE ROLLER IN A SYSTEMATIC MANNER TO ASSURE THE NUMBER OF PASSES OVER ALL AREAS, AND AT SPEEDS BETWEEN 2.5 AND 3.5 MILES PER HOUR. WHEN PROOF ROLLING UNDER STRUCTURES, ONE–HALF OF THE PASSES MADE WITH THE ROLLER SHALL BE IN A DIRECTION PERPENDICULAR TO THE OTHER PASSES.

PROOF ROLLING SHALL BE DONE IN THE PRESENCE OF THE ENGINEER. RUTTING OR PUMPING SHALL INDICATE UNSATISFACTORY MATERIAL AND THAT MATERIAL SHALL BE UNDERCUT AS DETERMINED BY THE ENGINEER, AND REPLACED WITH THE APPROPRIATE FILL MATERIAL.

PERFORM PROOF ROLLING ONLY WHEN WEATHER CONDITIONS PERMIT. DO NOT PROOF ROLL WET OR SATURATED SUBGRADES. MATERIALS DEGRADED BY PROOF ROLLING A WET OR SATURATED SUBGRADE SHALL BE REPLACED BY THE CONTRACTOR AS DETERMINED BY THE ENGINEER AT NO COST TO THE OWNER. NOTIFY THE ENGINEER 3 DAYS PRIOR TO PROOF ROLLING.

SUBGRADE UNDERCUT EXCAVATION

UNSUITABLE SUBGRADE EXCAVATIONS SHALL BE THE OPERATION OF:

(1) REMOVING UNSUITABLE SOILS AS DETERMINED BY THE ENGINEER, BELOW THE LEVEL OF THE GROUND AFTER TOPSOIL HAS BEEN STRIPPED IN FILL AREAS WHERE THE EMBANKMENT IS TO BE FIVE (5) FEET OR LESS IN HEIGHT TO PLAN GRADE, OR
(2) THE REMOVAL OF UNSUITABLE SOILS BELOW THE SUBGRADE ELEVATION, AS DETERMINED BY THE ENGINEER IN CUT AREAS AFTER THE SUBGRADE HAS BEEN ESTABLISHED.

IN FILL AREAS, THE ENGINEER WILL INSPECT THE EMBANKMENT AREA TO CERTIFY THE ADEQUACY OF THE NATIVE SOILS AND TO DETERMINE THE EXTENT OF ANY ADDITIONAL EXCAVATION OF UNSUITABLE SOILS PRIOR TO PLACING THE FIRST LIFT OF THE EMBANKMENT.

IN CUT AREAS AFTER THE SUBGRADES ELEVATION HAS BEEN ESTABLISHED BY THE MASS GRADING OPERATION, THE ENGINEER WILL INSPECT THE SUBGRADE TO DETERMINE THE EXTENT OF ANY ADDITIONAL EXCAVATION OF UNSUITABLE SOILS.

THE AREAS EXCAVATED OF UNSUITABLE MATERIAL, UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE BACKFILLED WITH NONFROST HEAVING MATERIAL SIMILAR TO THE ADJACENT SOIL. HOWEVER, IN AREAS AS DETERMINED BY THE ENGINEER WHERE FREE WATER DUE TO SEEPAGE IS PRESENT, THE EXCAVATION SHALL BE BACKFILLED WITH GRANULAR MATERIAL, CLASS II, AND DRAINAGE SHALL BE PROVIDED. THE BACKFILL SHALL BE COMPACTED TO NOT LESS THAN 95% OF THE MAXIMUM UNIT WEIGHT, UNLESS OTHERWISE SPECIFIED.

TRIMMING AND FINISHING EARTH GRADE

AFTER THE EARTH GRADE HAS BEEN CONSTRUCTED TO THE REQUIRED GRADE, ALL STONES AND ROCKS MORE THAN THREE (3) INCHES IN DIAMETER, APPEARING ON THE SURFACE OF THE SUBGRADE SHALL BE REMOVED.

THE EARTH GRADE AND THE SUBGRADE SHALL BE TRIMMED TO THE GRADE CALLED FOR ON THE PLANS. THE SUBGRADE, WHERE A SUBBASE IS REQUIRED, SHALL BE TRIMMED TO THE ESTABLISHED GRADE WITHIN ± ¾ INCH.

THE EARTH GRADE OUTSIDE THE SUBGRADE SHALL BE TRIMMED, ALL IRREGULARITIES MADE SMOOTH AND THE ENTIRE SITE COMPLETED TO THE REQUIRED LINES, GRADES, AND CROSS SECTIONS.

SUBBASE

GRANULAR MATERIAL FOR SUBBASE SHALL BE EVENLY SPREAD AND COMPACTED AS SPECIFIED IN MDOT SECTION 301.

THE THICKNESS OF EACH LAYER PLACED SHALL BE DETERMINED BY THE REQUIRED DENSITY OBTAINED BUT SHALL NOT EXCEED 15 INCHES IN DEPTH, LOOSE MEASURE.

THE SUBBASE SHALL BE CONSTRUCTED TO THE ALIGNMENT, GRADE AND CROSS SECTION SHOWN ON THE PLANS. SHOULD THE SUBGRADE AT ANY TIME PRIOR TO OR DURING THE PLACING OF THE SUBBASE BECOME SOFT OR UNSTABLE SO THAT RUTTING OCCURS IN THE SUBGRADE, OR IF THE SUBGRADE MATERIAL IS FORCED UP IN TO THE SUBBASE MATERIAL, THE OPERATION SHALL IMMEDIATELY CEASE AND THE MIXED MATERIAL SHALL BE REMOVED AND DISPOSED OF. THE SUBGRADE SHALL BE CORRECTED AND NEW SUBBASE MATERIAL PLACED AND COMPACTED. THIS WORK SHALL BE CONSIDERED INCIDENTAL TO THE CONSTRUCTION OF THE PROJECT.

SCARIFY, RE–GRADE AND COMPACT EXISTING SUBGRADE

THE EXISTING SUBGRADE (BASE) SHALL BE SCARIFIED TO A DEPTH OF 9–INCHES TO THE LIMITS AS SHOWN ON THE PLANS. THE SUBGRADE SHALL THEN BE RE–SHAPED TO THE CROSS SECTION AS SHOWN ON THE PLANS AND COMPACTED. THE SUBGRADE SHALL THEN BE COMPACTED TO 95% OF THE MAXIMUM UNIT WEIGHT BY ROLLING WITH A ROLLER WEIGHING NOT LESS THEN TEN (10) TONS.

DEFECTIVE WORK

ANY PORTION OF THE BACKFILL, SUBBASE OR SUBGRADE WHICH IS DEFICIENT IN THE SPECIFIED DENSITY SHALL BE CORRECTED BY METHODS MEETING THE APPROVAL OF THE ENGINEER.

ANY EXTRA TESTING OR SAMPLING REQUIRED BY THE ENGINEER, BECAUSE OF DEFICIENCIES, SHALL BE AT THE CONTRACTOR'S EXPENSE.

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ANIMAL CONTROL BUILDING
LIVINGSTON TOWNSHIP, OTSEGO COUNTY, MICHIGAN
GRADING NOTES PLAN

ISSUED FOR:	DATE:	BY:
SPA / APPROVALS	000410 / 100410	JRC
APPROVALS / CONSTRUCTION	021510 / 021310	JRC
BID	040511	JRC

JOB NO. APE2019.01G

SHEET C–4.1

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FIELD BOOK INFORMATION:–
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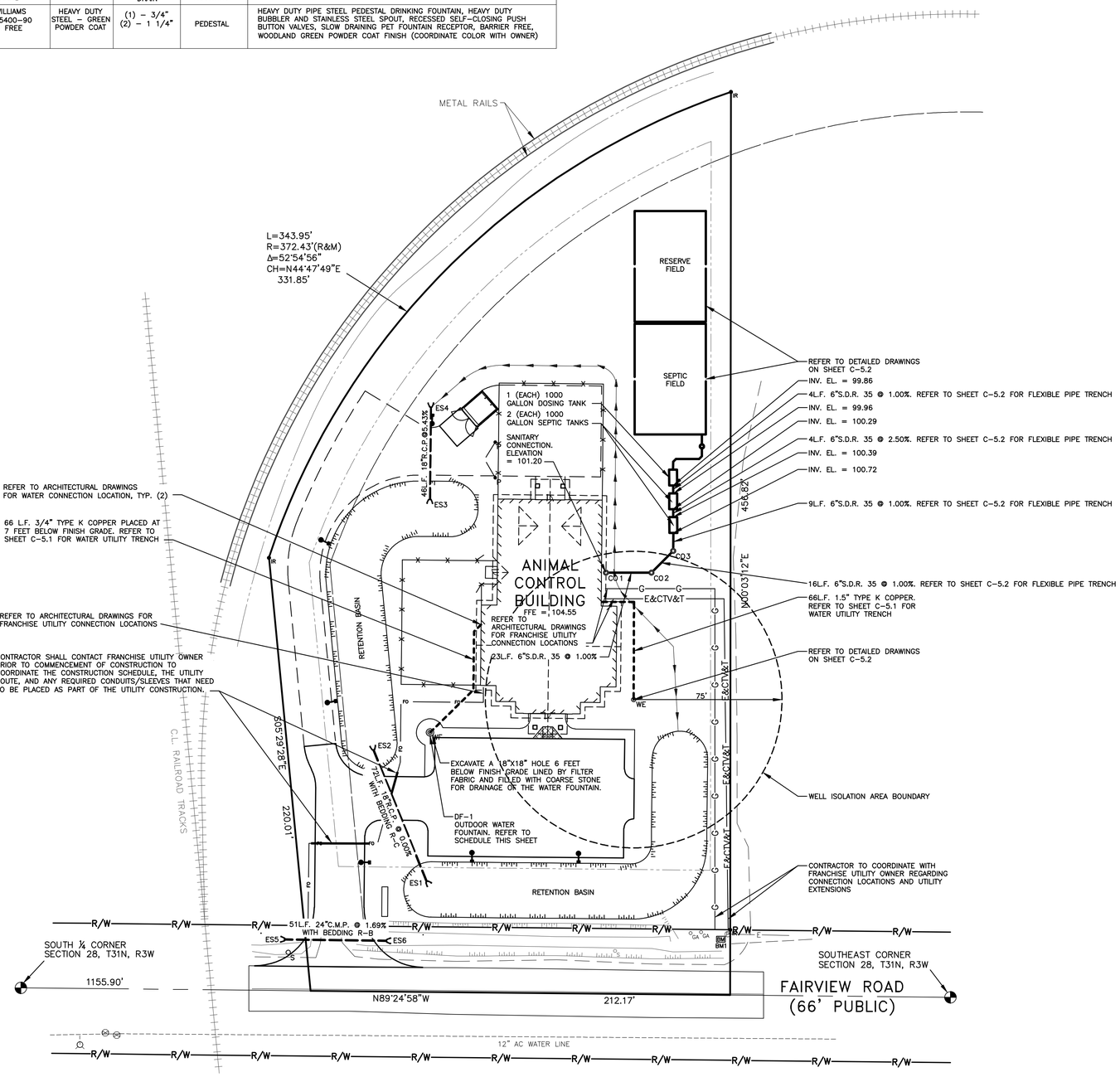
OUTDOOR DRINKING FOUNTAIN					
	MFR/MODEL#	FINISH	SUPPLY/ DRAIN	MOUNTING	
DF-1	STERN-WILLIAMS MODEL # 5400-90 BARRIER FREE	HEAVY DUTY STEEL - GREEN POWDER COAT	(1) - 3/4" (2) - 1 1/4"	PEDESTAL	HEAVY DUTY PIPE STEEL PEDESTAL DRINKING FOUNTAIN, HEAVY DUTY BUBBLER AND STAINLESS STEEL SPOUT, RECESSED SELF-CLOSING PUSH BUTTON VALVES, SLOW DRAINING PET FOUNTAIN RECEPTOR, BARRIER FREE, WOODLAND GREEN POWDER COAT FINISH (COORDINATE COLOR WITH OWNER)



LEGEND

WELL	WE
SANITARY CLEAN-OUT	CO
SANITARY SEWER	
WATER MAIN PIPE	
ELECTRIC/CABLE/TELEPHONE	E&CTV&T
FIBER OPTIC LINE	FO
GAS LINE	G
STORM PIPE	

N

UTILITY STRUCTURE SCHEDULE

ID	TYPE	STR. DIA (FT.)	RIM	"SIZE (IN.)"	DIRECTION	INVERT	NORTHING	EASTING	CASTING
ES1	R.C.P. END SECTION	N/A	N/A	18	N/A	99.00	50022.72	50047.80	N/A
ES2	R.C.P. END SECTION	N/A	N/A	18	N/A	99.00	50023.34	50049.71	N/A
ES3	R.C.P. END SECTION	N/A	N/A	18	N/A	99.00	50088.40	50033.00	N/A
ES4	R.C.P. END SECTION	N/A	N/A	18	N/A	101.50	50088.62	50035.01	N/A
ES5	C.M.P. END SECTION	N/A	N/A	24	N/A	99.00	49992.92	49990.11	N/A
ES6	C.M.P. END SECTION	N/A	N/A	24	N/A	100.00	49992.16	50049.05	N/A
CO1	CLEAN OUT	0.5	104.00	6	W, E	101.20	50178.43	50152.53	N/A
CO2	CLEAN OUT	0.5	104.20	6	W, NE	100.97	50178.43	50175.51	N/A
CO3	CLEAN OUT	0.5	104.50	6	N, SW	100.81	50189.50	50186.58	N/A

SITE UTILITY NOTES

1. ALL FILL MATERIAL IS TO BE IN PLACE, AND COMPACTED BEFORE INSTALLATION OF PROPOSED UTILITIES.
2. CONTRACTOR SHALL NOTIFY THE UTILITY AUTHORITIES INSPECTORS 72 HOURS BEFORE CONNECTING TO ANY EXISTING LINE.
3. SANITARY SEWER PIPE SHALL BE AS FOLLOWS:
   -SDR35 PER ASTM D 3034, FOR PIPES LESS THAN 12' DEEP
   -SDR26 PER ASTM D 3034, FOR PIPES MORE THAN 12' DEEP
4. WATER LINES SHALL BE AS FOLLOWS:
   -SMALLER THAN 6" EITHER COPPER TUBE TYPE "K" (SOFT) PER ANSI 816.22
5. MINIMUM TRENCH WIDTH SHALL BE 2 FEET.
6. RESTRAINED JOINTS ARE REQUIRED AT ALL VERTICAL AND HORIZONTAL CHANGES IN DIRECTIONAL FOR WATER MAIN.
7. ALL UTILITIES SHOULD BE KEPT TEN (10') APART (PARALLEL) OR WHEN CROSSING 18" VERTICAL CLEARANCE (OUTSIDE EDGE OF PIPE TO OUTSIDE EDGE OF PIPE).
8. CONTRACTOR SHALL MAINTAIN A MINIMUM OF 5'-5" COVER ON ALL WATERLINES.
9. IN THE EVENT OF A VERTICAL CONFLICT BETWEEN WATERLINES, SANITARY LINES, STORM LINES AND GAS LINES (EXISTING AND PROPOSED), THE SANITARY LINE SHALL BE DUCTILE IRON PIPE WITH MECHANICAL JOINTS AT LEAST 10 FEET ON BOTH SIDES OF CROSSING, THE WATERLINE SHALL HAVE MECHANICAL JOINTS WITH APPROPRIATE THRUST BLOCKING AS REQUIRED TO PROVIDE A MINIMUM OF 18" CLEARANCE. MEETING REQUIREMENTS OF ANSI A21.10 OR ANSI 21.11 (AWWA C-151)(CLASS 50).
10. LINES UNDERGROUND SHALL BE INSTALLED, INSPECTED AND APPROVED BEFORE BACKFILLING. CONTRACTOR IS RESPONSIBLE FOR CHECKING WITH LOCAL JURISDICTIONS AND SCHEDULING INSPECTIONS.
11. TOPS OF EXISTING MANHOLES SHALL BE RAISED AS NECESSARY TO BE FLUSH WITH PROPOSED PAVEMENT ELEVATIONS, AND TO BE TWO INCHES ABOVE FINISHED GROUND ELEVATIONS WITH WATER TIGHT LIDS.
12. ALL CONCRETE FOR ENCASEMENTS SHALL HAVE A MINIMUM 28 DAY COMPRESSION STRENGTH AT 3000 P.S.I.
13. EXISTING UTILITIES SHALL BE VERIFIED IN FIELD PRIOR TO INSTALLATION OF ANY NEW LINES.
14. REFER TO INTERIOR PLUMBING DRAWINGS FOR TIE-IN OF ALL UTILITIES.
15. CONTRACTOR IS RESPONSIBLE FOR COMPLYING TO THE SPECIFICATIONS OF LOCAL AUTHORITIES WITH REGARDS TO MATERIALS, CONNECTION AND INSTALLATION OF THE WATER AND SEWER LINES.
16. THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES, AND WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE APPROPRIATE UTILITY COMPANIES AT LEAST 72 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATION OF UTILITIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.
17. CONTRACTOR IS RESPONSIBLE FOR ALL NECESSARY INSPECTIONS AND/OR CERTIFICATIONS REQUIRED BY CODES AND/OR UTILITY SERVICE COMPANIES. THIS AND THE FINAL CORRECTIONS/CONNECTIONS OF THE SERVICE SHALL BE COMPLETED 30 DAYS PRIOR TO CERTIFICATE OF OCCUPANCY
18. CONTRACTOR SHALL COORDINATE WITH ALL UTILITY COMPANIES FOR INSTALLATION REQUIREMENTS AND SPECIFICATIONS.
19. REFER TO ARCHITECTURAL PLANS FOR SITE LIGHTING ELECTRICAL PLAN.
20. BACKFLOW PREVENTOR LOCATED INSIDE BUILDING. REFER TO ARCH/MEP PLANS.
21. ALL BENDS IN WATER MAIN ARE 45', UNLESS NOTED OTHERWISE.

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30 15 0 30 60
SCALE IN FEET

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UTILITY PLAN

ISSUED FOR:	DATE:	BY:
APPROVALS	011111	JRC
APPROVALS	021611	JRC
BID	040511	JRC

JOB NO. APE2019.01G

SHEET C-5.0

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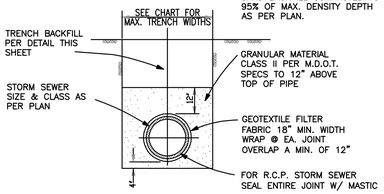
FIELD BOOK INFORMATION: -

TRENCH WIDTHS
MAX WIDTH OF TRENCH 12" ABOVE TOP OF PIPE
6" THRU 12" PIPE – 30" WIDE
15" THRU 36" PIPE – O.D. + 16"
42" THRU 60" PIPE – O.D. + 20"
OVER 60" PIPE – O.D. + 24"

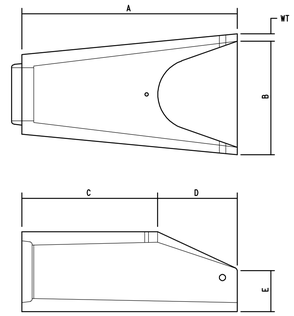
NOTE:
GEOTEXTILE FILTER FABRIC TO BE MIRAFI "140N" OR APPROVED EQUAL

NOTE:
ALL PIPE THAT RUNS BENEATH THE STREET TO RECIEVE 100% SAND BACKFILL COMPACTED TO 95% OF MAX. DENSITY DEPTH AS PER PLAN.



TYPICAL STORM SEWER TRENCH DETAIL

NOTE: ALL STORM SEWER SHALL BE REINFORCED CONCRETE PIPE CLASS C-76 IV UNLESS OTHERWISE NOTED ON PLANS

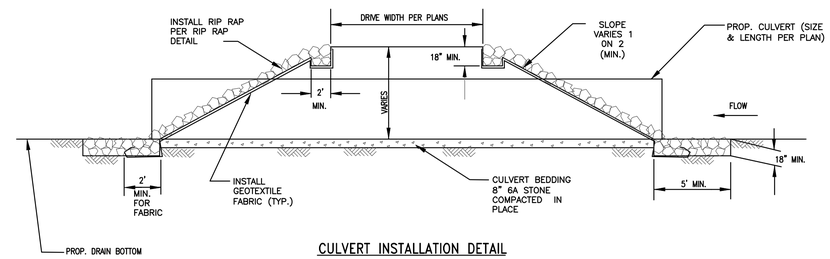


DIA.	WT	A	B	C	D	E	WEIGHT
12"	2 3/4"	69 5/8"	24"	45 5/8"	24"	4"	530#
15"	3"	69 1/2"	30"	42 3/4"	27"	6"	900#
18"	3 1/4"	69"	36"	42 1/4"	27"	9"	1,000#
24"	3 3/4"	69 1/4"	48"	25 3/4"	43 1/2"	9 1/2"	1,600#
30"	4 1/4"	69"	60"	15"	54"	12"	2,250#
36"	4 3/4"	92 1/2"	72"	29 1/2"	63"	15"	4,480#

GENERAL NOTES:
1. TONGUE AND/OR GROOVE JOINTS ARE REQUIRED.

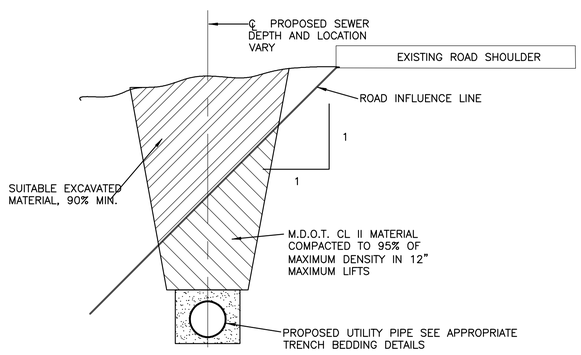
FLARED END SECTION DETAIL

NO SCALE



CULVERT INSTALLATION DETAIL

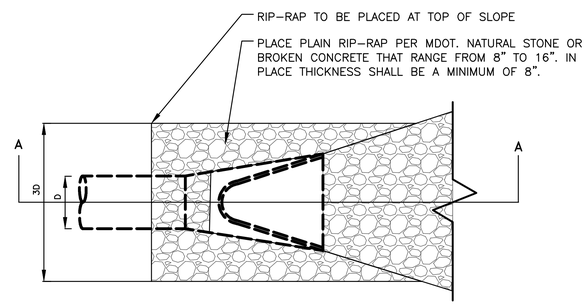
(NO HEADWALLS)



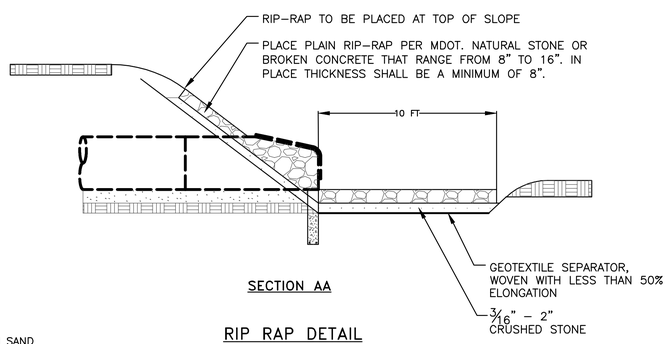
TRENCH BACKFILL DETAIL

NO SCALE

(PARKING AREA, ROAD BED OR SHOULDER)



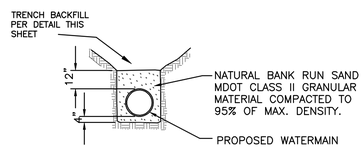
PLAN VIEW



SECTION AA

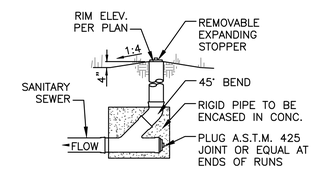
RIP RAP DETAIL

NOT TO SCALE



NOTE:
MAXIMUM TRENCH WIDTH: 2" THRU 14" PIPE + 30" WIDE
MAXIMUM TRENCH WIDTH: 18" PIPE + OUTSIDE DIA. PLUS 16"
MINIMUM TRENCH WIDTH SHALL BE ON EACH SIDE OF THE PIPE
TRENCH WIDTHS ARE MEASURED AT 12" ABOVE TOP OF PIPE

WATERMAIN BEDDING DETAIL



SANITARY CLEANOUT DETAIL

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LIVINGSTON TOWNSHIP, OTSEGO COUNTY, MICHIGAN
UTILITY DETAILS PLAN

ISSUED FOR:	DATE:	BY:
APPROVALS	011111	JRC
APPROVALS	021611	JRC
BID	040511	JRC

JOB NO. APE2019.01G

SHEET C-5.1

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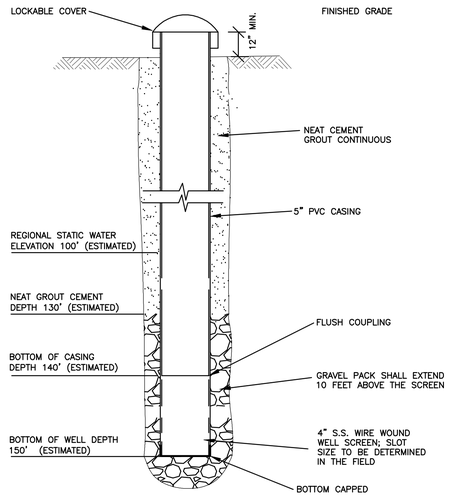
FIELD BOOK INFORMATION:-



WELL DETAIL

NO SCALE

NOTES:

1. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING A WELL AND SEPTIC PERMIT FROM NORTHWEST MICHIGAN COMMUNITY HEALTH AGENCY – OTSEGO COUNTY.
2. ALL CONSTRUCTION OF THE SEWAGE DISPOSAL SYSTEM SHALL CONFORM TO THE SANITARY CODE OF NORTHWEST MICHIGAN COMMUNITY HEALTH AGENCY – OTSEGO COUNTY.
3. GRAVITY SEWER PIPE AND FITTINGS SHALL BE PVC, SCH. 40 WITH GLUED JOINTS IN ACCORDANCE WITH ASTM D1785 OR SDR 35 WITH PUSH–ON GASKETED JOINTS IN ACCORDANCE WITH ASTM 3034. PRESSURE SEWER PIPE AND FITTINGS SHALL BE PVC, SCH. 40 WITH GLUED JOINTS IN ACCORDANCE WITH ASTM D1785.
4. FURNISH AND INSTALL AN EFFLUENT FILTER SUITABLE FOR MINIMUM 1500 GPD. PROVIDE MINIMUM 24" HDPE ACCESS RISER AND LID WITH TAMPER RESISTANT, STAINLESS STEEL FASTENERS.
5. CONTRACTOR SHALL STRIP AND STOCKPILE TOPSOIL MATERIAL UNDER THE PROPOSED DRAIN FIELD.
6. NOTIFY THE HEALTH OFFICER A MINIMUM OF TWO (2) WORKING DAYS OR 48 HOURS IN ADVANCE FOR INSPECTION OF THE SITE.
7. THE CONTRACTOR SHALL INSTALL THE SEPTIC TANKS, EFFLUENT FILTER, DOSING TANK, PUMPS, CONTROLS, PIPING AND DRAIN FIELD; THEN CALL FOR AN INSPECTION BY THE HEALTH OFFICER PRIOR TO COVERING THE DRAIN FIELD.
8. CONTRACTOR SHALL GRADE TOP OF DRAIN FIELD SUCH THAT DRAINAGE OR POSITIVE SLOPE IS PROVIDED.
9. FURNISH OWNER WITH TWO (2) COPIES OF OPERATION AND MAINTENANCE MANUAL FOR EFFLUENT FILTER, PUMPS & CONTROLS, AND DISTRIBUTING VALVE.

BASIS OF DESIGN:

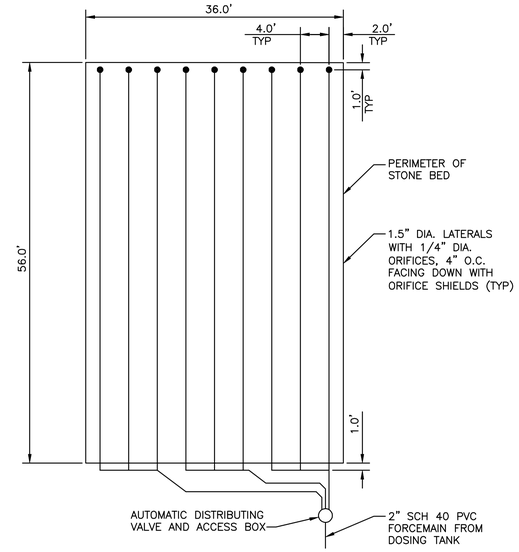
BUILDING USE:	VET CLINIC AND KENNEL
VET CLINIC REU:	1.5
NO. OF KENNELS:	32
REU CRITERIA:	0.1 REU/KENNEL
NO. OF REUS:	4.7
FLOW CRITERIA:	300 GPD/REU
DESIGN FLOW:	1500 GPD

SEPTIC TANK VOLUME = 1,000 GAL PRIMARY; 1,000 GAL SECONDARY; 2,000 GAL TOTAL
APPLICATION RATE = 0.75 GPD/SFT (SUITABLE FOR MEDIUM SAND)

ABSORPTION BED SIZE = 36' x 56', 2,016 SFT
9 EACH – 1.5" LATERAL, 4'–0" O.C., 56' LONG, (13) 0.25" ORIFICES @ 4'–0" O.C.
SOLID 3" MANIFOLD AND FORCE MAIN

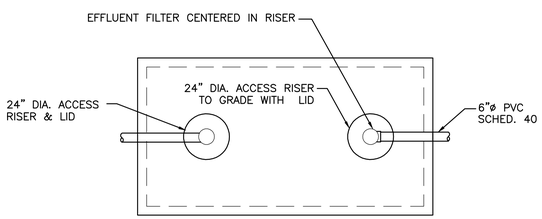
DOSE EACH ZONE OF ABSORPTION BED WITH EFFLUENT PUMP (3 ZONES TOTAL)
VOLUME OF PIPE IN DRAIN FIELD ZONE = 17.6 GALLONS
VOLUME OF PIPE IN FORCE MAIN AND HEADER = 112.3 GALLONS
TOTAL VOLUME IN PIPE = 29.9 GALLONS
DOSE VOLUME = 299 GALLONS (MINIMUM)

DOSING PUMP DESIGN: STATIC HEAD = 4.8 FT
FRICTION HEAD, INCLUDING FITTINGS = 17.6 FT
IN–LINE PRESSURE HEAD = 3 FT
PUMP DESIGN = 50 GPM AT 25.4 FT TDH

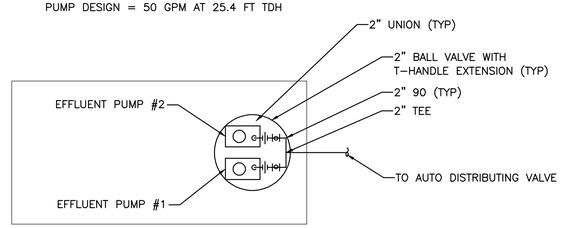


ABSORPTION BED LAYOUT

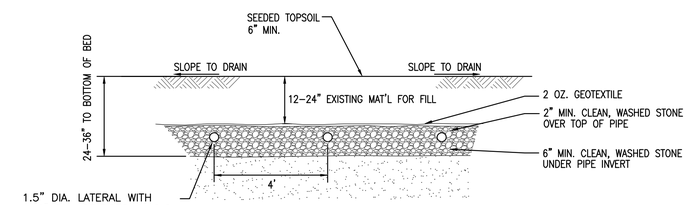
SCALE: 1" = 10'



PLAN



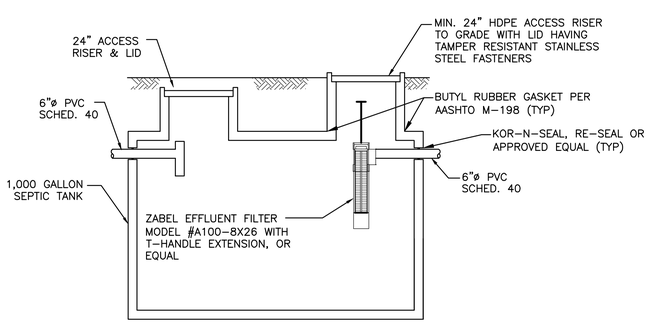
PLAN



ABSORPTION BED DETAIL

NO SCALE

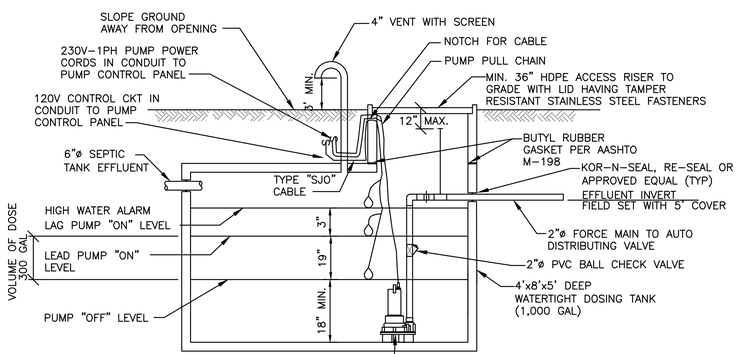
NOTE: STONE GRADATION SHALL BE 1/2" MINIMUM TO 1–1/2" MAXIMUM



SECTION

SEPTIC TANK DETAIL

NO SCALE

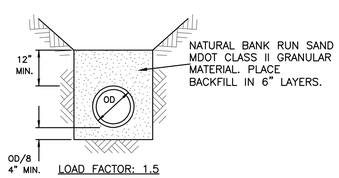


SECTION

TWO (2) GOULDS SERIES 3885 MODEL WE0512H EFFLUENT PUMPS (0.5 HP, 230V, 1 PH) OR EQUAL. PROVIDE AND INSTALL DUPLEX PUMP CONTROLLER AS SUPPLIED BY PUMP MANUFACTURER WITH HIGH WATER ALARM, LIGHTENING ARRESTOR AND ELAPSED TIME METERS (CENTRIPRO MODEL CDD11016). FURNISH EACH PUMP WITH 2" BASE ELBOW AND RAIL SYSTEM KIT WITH STAINLESS STEEL GUIDE RAILS (GOULDS MODEL A10–20).

DOSING TANK DETAIL

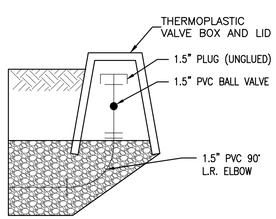
NO SCALE



CLASS "C"

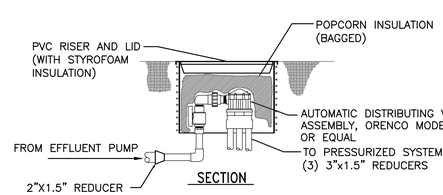
FLEXIBLE PIPE BEDDING DETAIL

NO SCALE



VALVED RISER DETAIL

NO SCALE



SECTION

NOTE: VALVE ELEVATION MUST BE AT THE HIGHEST POINT IN THE SYSTEM FOR PROPER OPERATION

AUTOMATIC DISTRIBUTING VALVE & ACCESS BOX

NO SCALE

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ANIMAL CONTROL BUILDING
LIVINGSTON TOWNSHIP, OTSEGO COUNTY, MICHIGAN
UTILITY DETAILS PLAN

ISSUED FOR:	DATE:	BY:
APPROVALS	011111	JRC
APPROVALS	021611	JRC
BID	040511	JRC

JOB NO. APE2019.01G

SHEET C–5.2

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PROJECT MANAGER:– FIELD BOOK INFORMATION:–
C:\DOCUMENTS AND SETTINGS\JCIESIELSKI\DESKTOP\EXPORT\APE2019\01F\PUBLISH\2011\4405\TOP–PLTS–DETAILS.DWG – C–5.2 – PLOTTED 4/5/2011 11:42 AM BY CIESIELSKI, JOHN

GENERAL ELECTRICAL SITE NOTES:

1. THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF WORK. CONTRACTOR SHALL PROVIDE AND INSTALL ALL MATERIALS (I.E. CONDUIT, WIRE, PULL BOXES, FIXTURES, ETC.) REQUIRED FOR A COMPLETE AND FUNCTIONAL SYSTEM.

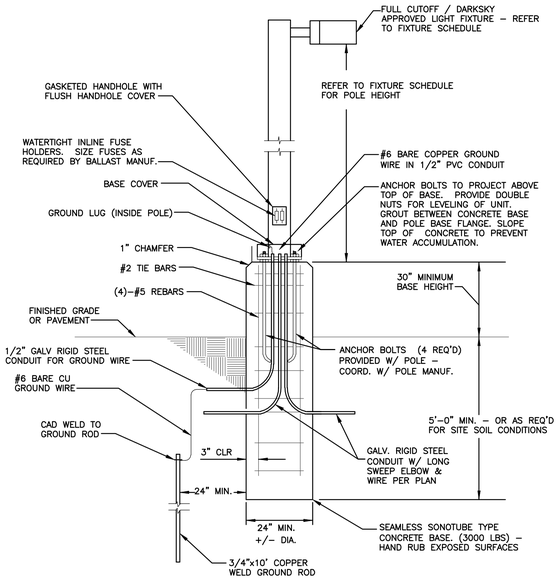
2. THE UTILITIES SHOWN ON THESE DRAWINGS ARE FOR REFERENCE ONLY. CONTRACTOR SHALL COORDINATE THE EXACT LOCATION OF ALL EXISTING UTILITIES, AND ROUTING OF ALL NEW UTILITIES, WITH RESPECTIVE TRADES (GENERAL, PLUMBING, CIVIL, UTILITY COMPANIES, ETC.). CONTACT MISS DIG FIVE WORKING DAYS PRIOR TO DIGGING.

3. ALL UNDERGROUND ELECTRICAL THAT IS TO BE PLACED BELOW PAVEMENT OF ANY TYPE SHALL BE PLACED IN A CONDUIT.

4. ALL UNDERGROUND CONDUIT SHALL BE SCHEDULE 40 PVC, UNLESS NOTED OTHERWISE. USE RIGID STEEL CONDUIT WHERE EXPOSED ABOVE GRADE. UNDERGROUND CONDUITS SHALL BE INSTALLED AT MINIMUM 36" BELOW FINISHED GRADE, UNLESS NOTED OTHERWISE.

5. SITE LIGHTING FIXTURE BRANCH CIRCUIT WIRING SHALL BE MINIMUM #8 AWG COPPER CONDUCTORS (XHHW OR THHN), IN MINIMUM 1" DIAMETER CONDUIT, UNLESS NOTED OTHERWISE.

6. THE ELECTRICAL CONTRACTOR SHALL COORDINATE ALL UTILITY DEMOLITION, TEMPORARY WORK, AND NEW WORK ASSOCIATED WITH THIS PROJECT. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING DRAWINGS TO THE UTILITY FOR COORDINATION AND CHARGES. THE CONTRACTOR SHALL INCLUDE, IN HIS WORK, ALL OF THE UTILITY COMPANY'S (POWER, PHONE, CABLE, ETC.) FEES AND CHARGES REQUIRED TO PROVIDE SERVICES TO THE BUILDING/SITE.



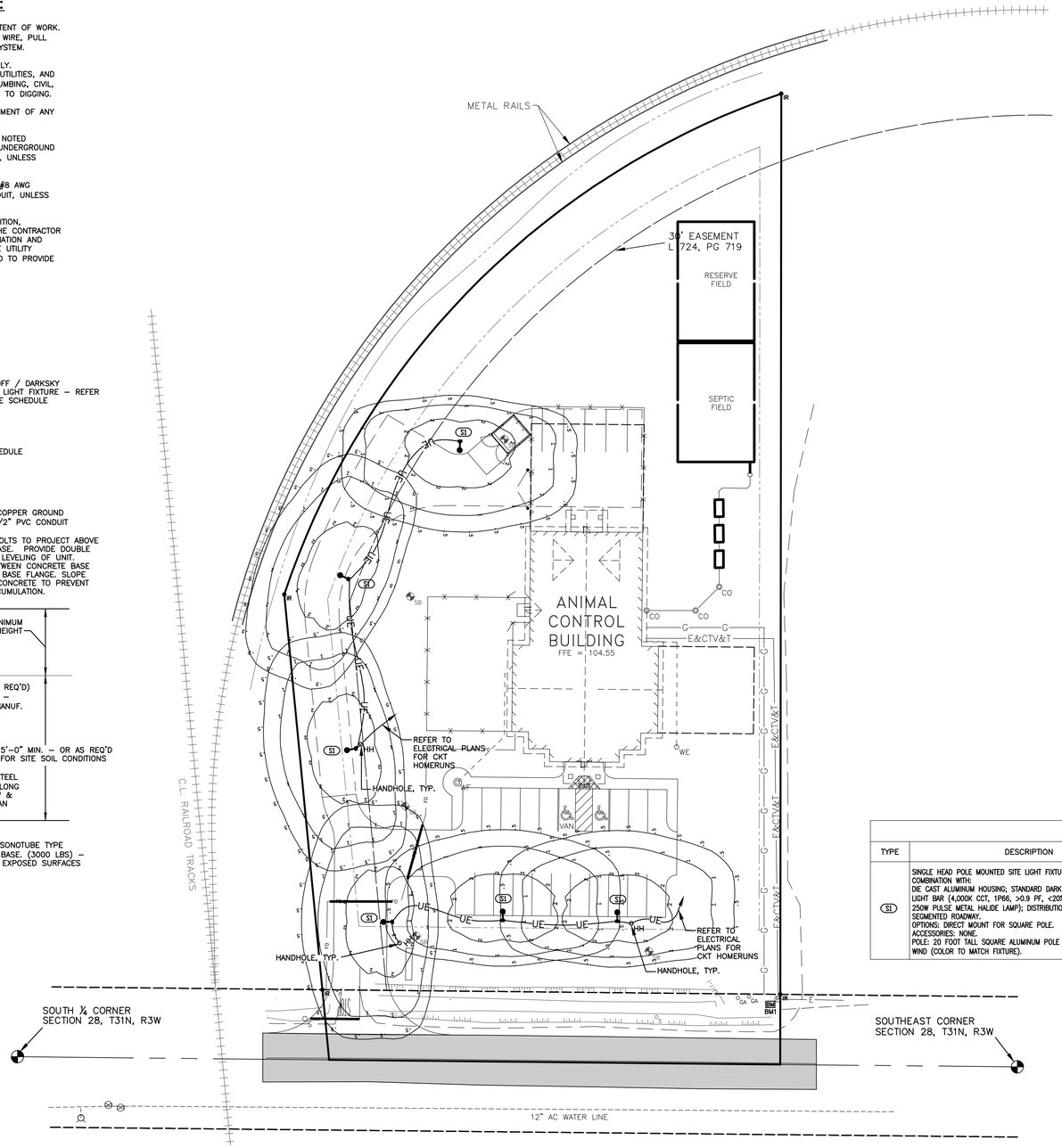
NOTES:

1. ANCHOR BOLTS AND TEMPLATES FURNISHED BY ELECTRICAL CONTRACTOR. UNLESS NOTED OTHERWISE, CONCRETE BASE AND ANCHOR BOLTS INSTALLED BY ELECTRICAL CONTRACTOR.

2. BASE SHALL BE 3000 PSI CONCRETE STONED AND SACKED EXPOSED PORTION.

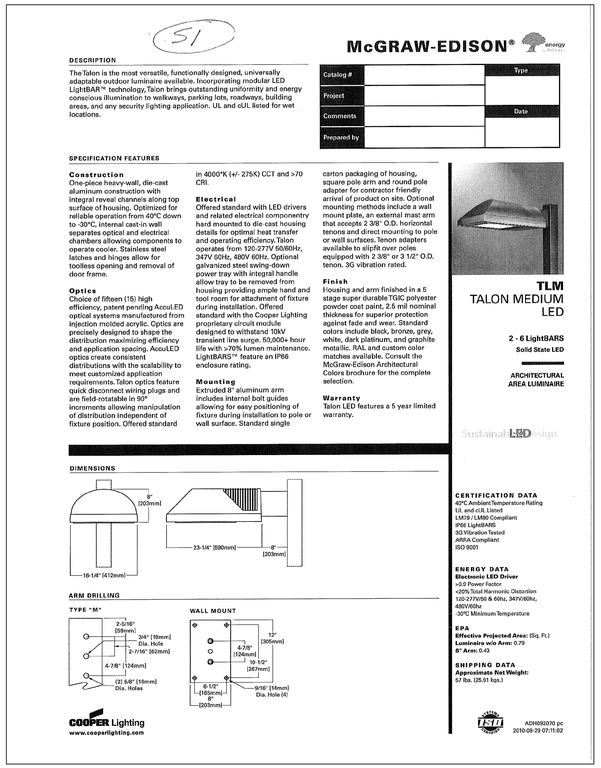
3. STANDARDS TO WITHSTAND WIND LOADS OF 100 MPH MINIMUM.

SITE LIGHTING POLE DETAIL
NO SCALE



NORTH

ELECTRICAL SITE PLAN
SCALE: 1" = 30'



S1

McGRAW-EDISON® energy efficient

Catalog #		Type
Project		
Comments		Date
Prepared by		

DESCRIPTION

The Talon is the most versatile, functionally designed, universally adaptable outdoor luminaire available. Incorporating modular LED LightBAR™ technology, Talon brings outstanding uniformity and energy conscious illumination to walkways, parking lots, roadways, building areas, and any security lighting application. UL and cUL listed for wet locations.

SPECIFICATION FEATURES

Construction
One-piece heavy-wall, die-cast aluminum construction with integral reveal channels along top surface of housing. Optimized for reliable operation from 40°C down to -30°C. Internal cast-in wall separates optical and electrical chambers allowing components to operate cooler. Stainless steel latches and hinges allow for toolless opening and removal of door frame.

Optics
Choice of fifteen (15) high efficiency, patent pending AccuLED optical systems manufactured from injection molded acrylic. Optics are precisely designed to shape the distribution maximizing efficiency and application spacing. AccuLED optics create consistent distributions with the scalability to meet customized application requirements. Talon optics feature quick disconnect wiring plugs and are field-rotatable in 90° increments allowing manipulation of distribution independent of fixture position. Offered standard in 4000°K (+/- 275K) CCT and >70 CRI.

Electrical
Offered standard with LED drivers and related electrical componentry hard mounted to die cast housing details for optimal heat transfer and operating efficiency. Talon operates from 120-277V 50/60Hz, 347V 60Hz, 480V 60Hz. Optional galvanized steel swing-down power tray with integral handle allow tray to be removed from housing providing ample hand and tool room for attachment of fixture during installation. Offered standard with the Cooper Lighting proprietary circuit module designed to withstand 10kV transient line surge. 50,000+ hour life with >70% lumen maintenance. LightBARS™ feature an IP66 enclosure rating.

Mounting
Extruded 8" aluminum arm includes internal bolt guides allowing for easy positioning of fixture during installation to pole or wall surface. Standard single carton packaging of housing, square pole arm and round pole adapter for contractor friendly arrival of product on site. Optional mounting methods include a wall mount plate, an external mast arm that accepts 2 3/8" O.D. horizontal tenons and direct mounting to pole or wall surfaces. Tenon adapters available to slipfit over poles equipped with 2 3/8" or 3 1/2" O.D. tenon. 3G vibration rated.

Finish
Housing and arm finished in a 5 stage super durable TGIC polyester powder coat paint. 2.5 mil nominal thickness for superior protection against fade and wear. Standard colors include black, bronze, grey, white, dark platinum, and graphite metallic. RAL and custom color matches available. Consult the McGraw-Edison Architectural Colors brochure for the complete selection.

Warranty
Talon LED features a 5 year limited warranty.

TLM
TALON MEDIUM LED

2 - 6 LightBARS
Solid State LED

ARCHITECTURAL AREA LUMINAIRE

Sustainal LED Design

DIMENSIONS

16-1/4" [412mm] · 8" [203mm] · 23-1/4" [590mm] · 8" [203mm]

ARM DRILLING

TYPE "M"
2-5/16" [59mm] · 3/4" [19mm] Dia. Hole · 2-7/16" [62mm] · 4-7/8" [124mm] · (2) 5/8" [16mm] Dia. Holes

WALL MOUNT
12" [305mm] · 4-7/8" [124mm] · 10-1/2" [267mm] · 6-1/2" [165mm] · 8" [203mm] · 9/16" [14mm] Dia. Hole (4)

CERTIFICATION DATA
40°C Ambient Temperature Rating
UL and cUL Listed
LM79 / LM80 Compliant
IP66 LightBARS
3G Vibration Tested
AWA Compliant
ISO 9001

ENERGY DATA
Electronic LED Driver
>0.9 Power Factor
<20% Total Harmonic Distortion
120-277V/50 & 60hz, 347V/60hz, 480V/60hz
-30°C Minimum Temperature

EPA
Effective Projected Area: (Sq. Ft.)
Luminaire w/o Arm: 0.79
8" Arm: 0.43

SHIPPING DATA
Approximate Net Weight:
57 lbs. (25.91 kgs.)

ADH0920070 pc
2010-09-29 07:11:02

COOPER Lighting
www.cooperlighting.com

LIGHTING FIXTURE SCHEDULE

TYPE	DESCRIPTION	MANUFACTURERS	LAMPS	VOLTS/WATTS	REMARKS
S1	SINGLE HEAD POLE MOUNTED SITE LIGHT FIXTURE AND POLE COMBINATION WITH: DIE CAST ALUMINUM HOUSING; STANDARD DARK BRONZE FINISH; LED LIGHT BAR (4,000K CCT, 1P66, >0.9 PF, <20% TDH, 156W INPUT = TO 250W PULSE METAL HALIDE LAMP); DISTRIBUTION TYPE = TYPE 3 SEGMENTED ROADWAY. OPTIONS: DIRECT MOUNT FOR SQUARE POLE. ACCESSORIES: NONE. POLE: 20 FOOT TALL SQUARE ALUMINUM POLE RATED FOR 100 MPH WIND (COLOR TO MATCH FIXTURE).	1. MCGRAW–EDISON "TALON MEDIUM LED" SERIES MODEL# TLM–A06–LED–E1–T3–BZ–DM WITH 20' TALL SQUARE ALUMINUM POLE. 2. ENGINEER APPROVED EQUAL BY LITHONIA OR KIM	LED LIGHT BAR = 10,400 LUMEN OUTPUT; 4,000K TEMP	208V / 156W	

BID PLANS NOT FOR CONSTRUCTION

30 15 0 30 60
SCALE IN FEET

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LIVINGSTON TOWNSHIP, OTSEGO COUNTY, MICHIGAN
ELECTRICAL SITE PLAN

ISSUED FOR:	DATE:	BY:
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SHEET ES–1.0

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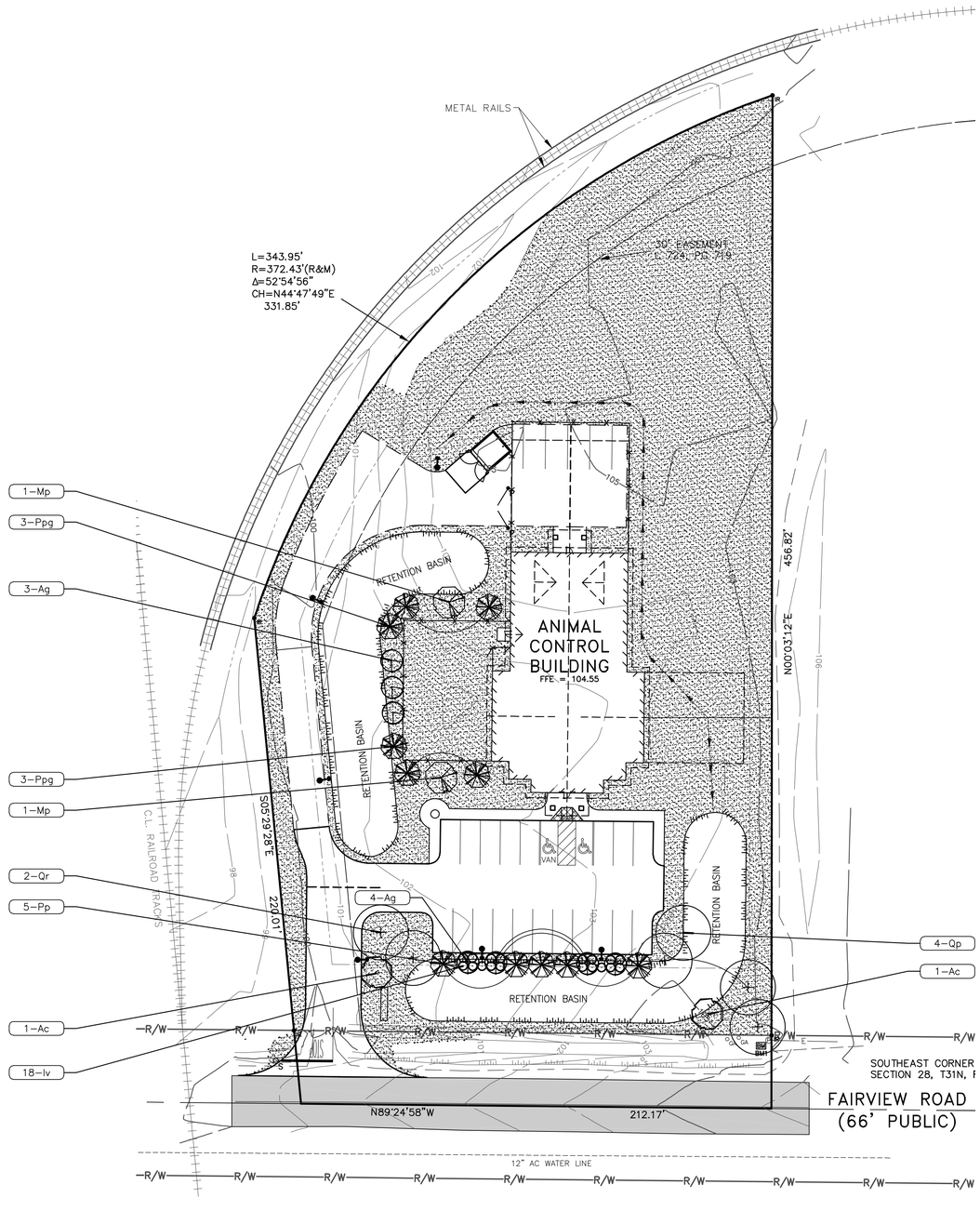
FIELD BOOK INFORMATION:–



PLANT LIST

Key	Qty.	Botanical / Common Name	Size	Spacing	Root	Comments
TREES						
Ac	2	Amelanchier x grandiflora 'Autumn Brilliance' Autumn Brilliance Serviceberry	7–8' ht.	As Shown	B&B	Clump Form
Ag	4	Acer ginnala Amur Maple	7–8' ht.	As Shown	B&B	Clump Form
Mp	2	Malus 'Prairifire' Prairifire Crab	2 ½" cal.	As Shown	B&B	
Ppg	6	Picea pungens v. glauca Blue Colorado Spruce	7–8' ht.	As Shown	B&B	
Pp	5	Picea pungens Colorado Spruce	7–8' ht.	As Shown	B&B	
Qp	4	Quercus palustris Pin Oak	3" cal.	As Shown	B&B	
Qr	2	Quercus rubra Red Oak	3" cal.	As Shown	B&B	
SHRUBS						
Iv	18*	Ilex verticillata 'Winter Red' Winter Red Winterberry	No. 5 Cont.	6' o.c.	Container	Male & Female Form
Vs	2	Viburnum sargentii 'Onondaga' Red Sunset Maple	No. 5 Cont.	As Shown	Container	

* 16 FEMALE AND 2 MALE PLANTS – ONE MALE PLANT PER PLANT GROUPING

4" TOPSOIL, SEED & MULCH

LANDSCAPE CALCULATIONS:

BUFFER YARDS
BUFFER YARDS SHALL BE CONSTRUCTED TO MITIGATE PROBLEMS ASSOCIATED WITH TRAFFIC, NOISE, VIBRATION, ODOR, GLARE, DUST, SMOKE, POLLUTION, WATER VAPOR, CONFLICTING LAND USES AND DENSITY, HEIGHT, MASS, LAYOUT OF ADJACENT USES, LOSS OF PRIVACY, UNSIGHTLY VIEWS AND OTHER POTENTIALLY NEGATIVE EFFECTS OF DEVELOPMENT

BUFFER YARDS SHALL BE LOCATED ON THE OUTER PERIMETER OF A LOT OR PARCEL, EXTENDING TO THE LOT OR PARCEL BOUNDARY LINE.

REFER TO TABLES I AND II IN SECTION 18.18 OF THE ZONING ORDINANCE FOR DETAILS ON BUFFER YARD DIMENSIONS AND PLANT MATERIAL SPECIFICATIONS.

CALCULATIONS
LINEAR FEET OF FRONTAGE ON ROAD: 187' (ASSUME 200')

200 LINEAR FEET / 100 FT = 2
2 X REQUIRED PLANTS PER 100 FT = TOTAL REQUIRED PLANTS
(SEE BELOW)

LANDSCAPE REQUIREMENTS

REQUIRED PLANTS PER 100 LINEAR FEET (MULTIPLIED BY 2)

REQUIRED PLANTS
6 CANOPY TREES
6 FLOWERING TREES OR LARGE SHRUBS
12 SHRUBS
4 EVERGREENS & CONIFERS

PROVIDED PLANTS (IN BUFFER YARD)
6 CANOPY TREES
6 FLOWERING TREES OR LARGE SHRUBS
18 SHRUBS
5 EVERGREEN & CONIFERS

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LANDSCAPE PLAN

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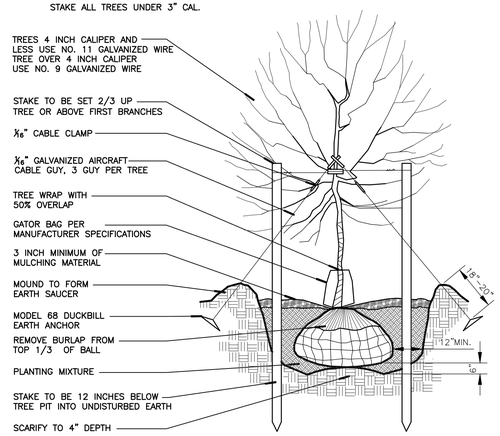
FIELD BOOK INFORMATION:

LANDSCAPE NOTES

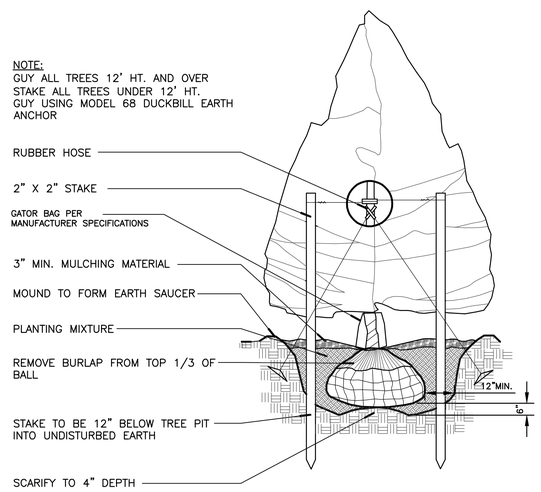
1. ALL PLANTS TO BE INSTALLED IN ACCORDANCE WITH AMERICAN ASSOCIATION OF NURSERYMEN LANDSCAPE STANDARDS.
2. CONTRACTOR SHALL PROVIDE A PLANTING MIXTURE MEETING THE REQUIREMENTS OF MDOT SPECIFICATION, SEED MIXTURE THM. IF THE ENGINEER HAS ANY CONCERNS WITH THE QUALITY OF THE PLANTING MIXTURE, THE ENGINEER SHALL BE ALLOWED TWO WEEKS TO OBTAIN SOIL TEST TO DETERMINE COMPLIANCE. NO PLANT MATERIAL SHALL BE PLANTED PRIOR TO ENGINEER APPROVAL OF PLANTING MIXTURE. ALL PLANT MATERIAL SHALL BE MAINTAINED BY THE CONTRACTOR IN A VIGOROUS GROWING CONDITION DURING THIS TIME AT NO ADDITIONAL COST.
3. SPACING OF PLANT MATERIALS SHALL BE AS SHOWN ON DRAWING OR ON PLANT LIST. THE ENGINEER SHALL REVIEW THE PLACEMENT OF PLANT MATERIAL PRIOR TO AND AFTER INSTALLATION, AND RESERVES THE RIGHT TO ADJUST LAYOUT TO ACCOMMODATE SITE CONDITIONS AND DESIGN INTENT.
4. ALL PLANT MATERIALS SHALL CONFORM TO PLANT SCHEDULES. SIZES SHALL BE THE MINIMUM STATED ON THE PLANT LIST OR LARGER. ALL MEASUREMENTS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE "A.A.N. STANDARDS FOR NURSERY STOCK."
5. NO PLANT SHALL BE PUT INTO THE GROUND BEFORE ROUGH GRADING HAS BEEN FINISHED AND REVIEWED BY THE ENGINEER.
6. FINAL PLANT LOCATIONS SHALL BE MARKED BY CONTRACTOR THREE WORKING DAYS PRIOR TO PLANTING FOR ENGINEER REVIEW.
7. ALL PLANTED PLANTS SHALL BEAR THE SAME RELATIONSHIP TO FINISHED GRADE AS THE PLANTS ORIGINAL GRADE BEFORE DIGGING.
8. PLANT MATERIAL, ESPECIALLY EVERGREENS, TO BE PLANTED HIGHER THAN NORMAL WHEN HEAVY SOIL CONDITIONS (CLAY, ETC.) PREVAIL.
9. IF FOR ANY REASON ANY BALLED AND BURLAPED PLANT MATERIALS NEED TO BE STORED ON SITE LONGER THAN A 24–HOUR PERIOD, THEIR ROOT BALLS SHALL BE PROTECTED. ALL PLANTS SHALL BE THOROUGHLY WATERED EACH DAY THEY ARE STORED ON SITE AND THROUGH CONSTRUCTION. ANY PLANTS ALLOWED TO DRY OUT AS DETERMINED BY THE ENGINEER WILL BE REJECTED.
10. NO CONTAINER GROWN STOCK WILL BE ACCEPTED IF IT IS ROOT BOUND. ALL WRAPPING MATERIALS MADE OF SYNTHETIC OR PLASTICS SHALL BE COMPLETELY REMOVED AT TIME OF PLANTING.
11. THE CONTRACTOR SHALL FILL PLANT PIT WITH PREPARED PLANT MIX TO ½ DEPTH OF ROOT BALL OR ROOT MASS, PACK FIRMLY, PUDDLE WITH WATER; THEN FOR BALLED AND BURLAPED MATERIAL, THE BURLAP AND ALL LACING (INCLUDING WIRE BASKET IF NECESSARY) SHALL BE REMOVED FROM THE UPPER 1/3 OF ROOTBALL, THEN FINISH BACKFILLING ADDING SOLID FERTILIZER TO THE PLANT MIX, PACK FIRMLY AND WATER. A SAUCER SHALL BE PLACED AROUND EVERY PLANT AND SHALL BE APPROVED PRIOR TO PLACEMENT OF ANY MULCH.
12. ALL DISTURBED LAWN AREAS SHALL BE RESTORED WITH 4–INCHES OF TOPSOIL, SPREAD, FINE GRADED, AND SEEDED AS SPECIFIED. THIS WORK SHALL BE INCIDENTAL TO THE PROJECT.
13. ALL TREES AND SHRUBS ARE TO BE FERTILIZED AT THE TIME OF PLANTING WITH AGRIFORM 21–GRAM FERTILIZER TABLETS AT RATES RECOMMENDED BY MANUFACTURER.
14. ALL TREES SHALL BE STAKED. THE STAKING SHALL BE ADJUSTED AND REPAIRED AS NECESSARY AND REMOVED AT THE END OF THE ESTABLISHMENT PERIOD.
15. ALL PLANTS AND STAKES SHALL BE SET PLUMB UNLESS OTHERWISE SPECIFIED. ALL GUYS AND STAKES MUST BE LOCATED WITHIN EACH TREES MULCHED AREA TO ELIMINATE THE POSSIBILITY OF MOWER CONTACT AND TO REDUCE MAINTENANCE.
16. AT PLANTING TIME, ALL DECIDUOUS TREES SHALL BE THINNED BY REMOVING INTERIOR SECONDARY TWIGS, INFERIOR BRANCHES, TEMPORARY BRANCHES, AND CROSSED BRANCHES ACCORDING TO ANSI A300–1995.
17. CONTRACTOR SHALL APPLY ENGINEER APPROVED PRE–EMERGENT HERBICIDE TO SHRUB AND GROUND COVER PLANTING AREAS AT THE TIME OF PLANTING (IF SPRING PLANTED) OR THE FOLLOWING SPRING. CONTRACTOR SHALL ENSURE THE PLANT MATERIALS ARE RESISTANT TO THE HERBICIDES PROPERTIES. HERBICIDE SHALL BE APPLIED ACCORDING TO MANUFACTURERS SPECIFICATIONS AND IN ACCORDANCE WITH SOUND HORTICULTURAL PRACTICES.
18. ALL EVERGREEN PLANTS SHALL BE SPRAYED ACCORDING TO MANUFACTURES INSTRUCTIONS WITH AN ANTI–DESICCANT THE FIRST WINTER. THE ENGINEER SHALL BE NOTIFIED THREE DAYS PRIOR TO THIS WORK.
19. ALL TREES, SHRUBS AND PERENNIAL GROUND COVER SHALL RECEIVE A MINIMUM DEPTH OF THREE INCHES DOUBLE SHREDDED HARDWOOD BARK MULCH. WHERE PLANT BEDS MEET PAVEMENTS, LAWN, OR STEEL EDGING CUT THE GRADE TO ALLOW FOR MULCH AND THREE–INCH DROP FROM ADJOINING FINISH GRADE.
20. ALL PLANT BEDS SHALL BE EXCAVATED TO A MINIMUM DEPTH OF 12–INCHES AND BACKFILLED WITH SPECIFIED PLANT MIX AS PER PERENNIAL PLANTING BED DETAIL. BEDS SHALL BE EDGED WITH METAL EDGING AROUND PERIMETER AS SHOWN IN TYPICAL PERENNIAL PLANTING DETAIL. ALL EDGING SHALL BE 4" WIDE – 12 GAUGE STEEL, COLOR BLACK. CONTRACTOR SHALL LAYOUT EDGING FOR APPROVAL AND INSTALL PER PERENNIAL PLANTING BED DETAIL.
21. THE CONTRACTOR SHALL NOTIFY MISS DIG (800) 482–7171 A MINIMIUM OF THREE WORKING DAYS PRIOR TO BEGINNING CONSTRUCTION IN THE AREA OF THE WORK.

NOTE: GUY ALL TREES 3" CAL. AND OVER
STAKE ALL TREES UNDER 3" CAL.

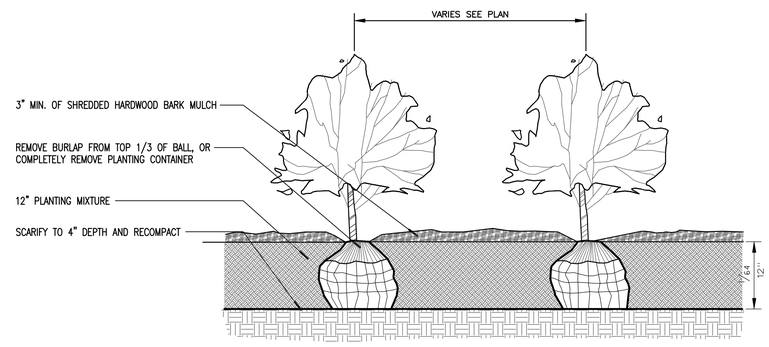


DECIDUOUS TREE PLANTING DETAIL
SECTION — NOT TO SCALE

NOTE:
GUY ALL TREES 12' HT. AND OVER
STAKE ALL TREES UNDER 12' HT.
GUY USING MODEL 68 DUCKBILL EARTH ANCHOR



EVERGREEN TREE PLANTING DETAIL
SECTION — NOT TO SCALE



SHRUB PLANTING BED DETAIL
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LANDSCAPE DETAILS & NOTES PLAN

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BID 2011-08 ADDENDUM #1 (05/03/2011)

Anthony Esson, Architect
PO Box 479
Gaylord, Michigan 49734

Otsego County
Animal Control Facility
Gaylord, Michigan

May 2, 2011

Project No. 160-10

ADDENDUM NO. 1

This Addendum is being issued for the purpose of modifying and/or clarifying the original Bidding Documents dated April 4, 2011 and shall take precedence over them.

All work included herein shall be in accordance with the general requirements of the original bidding documents, except as specifically noted herein.

This Addendum is being sent to all known plan holders, suppliers, plan rooms, and governmental agencies having received Bidding Documents.

Supplemental Documents Issued: Sketch SK-M2-1A
Sketch SK-E2-1A

Item No. 1: Project Manual; Invitation to Bid: Revise the Invitation to Bid to indicate that Bids may not be withdrawn for a period of sixty (60) days after

Item No. 2: Project Manual; Section 07270: Prosoco is an acceptable manufacturer of Air and Moisture Barriers.

Item No. 3: Project Manual; Section 08710: The following Manufacturers products are acceptable substitutions:
- Hinges: McKinney TA2714.
- Mortise Locksets: Yale 8800 Series.
- Cylindrical Locksets and Latchsets: Yale 5400LN Series.

Item No. 4: Project Manual; Section 15835 – Power Ventilators: Refer section 15835.2.01; Note that Soler & Palau may be bid as an equal manufacturer.

Item No. 5: Drawings; Sheet T: Refer to Sheet Index - Delete reference to Sheet A2.2 Equipment Elevations / Millwork Details.

Item No. 6: Drawings; Sheet C-3.1: Delete Dumpster Enclosure Gate detail in its entirety. Dumpster enclosure shall have vinyl coated galvanized steel chain link fabric with PVC privacy slats. Color shall match PVC fence. PVC fencing shall include 2” x 7” top and bottom rails with galvanized steel reinforcing, 5” x 5” wall posts with standard flat caps, and 7/8” x 11” tongue and groove pickets with U-channels around perimeter. PVC fencing for dumpster enclosure shall be 0.24” thickness and shall include middle rail. Fencing shall be as manufactured by Apple Fence in Traverse City, MI (Contact: Scott Sheffer @ 231-276-9888), or equal.

Item No. 7: Drawings; Sheet C3.0 and C3.1: Clarification – Chain link fencing shall be 6’-0” high at both locations.

Item No. 8: Drawings; Sheet L-1.0: Clarification – Top soil, seed and mulch shall extend to the north property line along the railroad right of way.

Item No. 9: Drawings; Sheet A2.1: Refer to Interior Elevations Tags in Rooms 110 and 111 - Interior Elevations 2 in Room 110 and 4 in Room 111 can be found on Sheet A2.1. Revise Interior Elevation Tags to reference A2.1 accordingly.

Item No. 10: Drawing M1: Refer to the HVAC PLAN – MEZZANINE - Note that per specification section 15128, flexible fiberglass duct insulation may also be used on the ductwork in the attic. In order to achieve 4" insulation thickness, two layers of flexible wrap will be required.

Item No. 11: Drawing M2, Separated Combustion Gas Fired Unit Heater Schedule: Refer to sketch SK-M2-1A, which is attached and issued as part of this Addendum. Note the following changes:

- Clarified that model numbers are Reznor. Note that Modine and Sterling may be bid as equals.
- Removed option for 2-stage gas valve.

Item No. 12: Drawing M3: Refer to the Indoor Separated Combustion Gas-Fired Duct Furnace Schedule. Note that the Contractor shall be responsible for field constructing the duct furnace floor mounted legs out of galvanized angle iron or uni-strut.

Item No. 13: Drawing E2: Refer to sketch SK-E2-1A, which is attached and issued as part of this Addendum. Note that the Electrical Contractor shall provide horsepower rated switch disconnects for unit heaters UH-A, UH-B, UH-C.

END OF ADDENDUM NO. 1

SKETCH SK-M2-1A

ADDENDUM #1 – MAY 2, 2011
NO SCALE

SEPARATED COMBUSTION GAS FIRED UNIT HEATER SCHEDULE

UNIT I.D.	GAS TYPE	CAPACITY INPUT MBH	CAPACITY OUTPUT MBH	AIRFLOW CFM	AIR TEMP RISE ° F	FAN			ELECTRICAL			FLUE SIZES INCHES	WEIGHT LBS	MODEL NO.	REMARKS
						TYPE	HP	RPM	VOLTS	PHASE	FLA				
UH-A	NATURAL	60	50	770	60	PROPELLER	0.06	1,550	115	1	3	2 @ 4"	75	UDAS 75	SEE NOTES
UH-B	NATURAL	45	37	630	55	PROPELLER	0.06	1,550	115	1	3	2 @ 4"	75	UDAS 75	SEE NOTES
UH-C	NATURAL	45	37	630	55	PROPELLER	0.06	1,550	115	1	3	2 @ 4"	75	UDAS 75	SEE NOTES

NOTES:

1. MODEL NUMBERS ARE REZNOR UNLESS OTHERWISE NOTED. STERLING, MODINE MAY ONLY BE BID AS EQUALS.
2. PROVIDE THE FOLLOWING STANDARD FEATURES: SEPARATED COMBUSTION SYSTEM, BUILT-IN ELECTRICAL DISCONNECT SWITCH, FULL FAN GUARD (OSHA APPROVED), TRANSFORMER FOR 24V T-STAT CONTROLS.
3. PROVIDE THE FOLLOWING OPTIONAL FEATURES (FACTORY INSTALLED): 409 STAINLESS STEEL HEAT EXCHANGER, TOTAL ENCLOSED FAN MOTOR.
4. PROVIDE THE FOLLOWING ACCESSORIES FOR FIELD INSTALLATION: VERTICAL COMBUSTION AIR/VENT KIT INCLUDING CONCENTRIC ADAPTER, 24V T-STAT AND T-STAT GUARD WITH LOCKING COVER, DOWNTURN NOZZLE KIT (25°-65° RANGE), CEILING SUSPENSION KIT.
5. CONTRACTOR SHALL PROVIDE/INSTALL VENTING PER MFR RECOMMENDATIONS AND CODE REQUIREMENTS.

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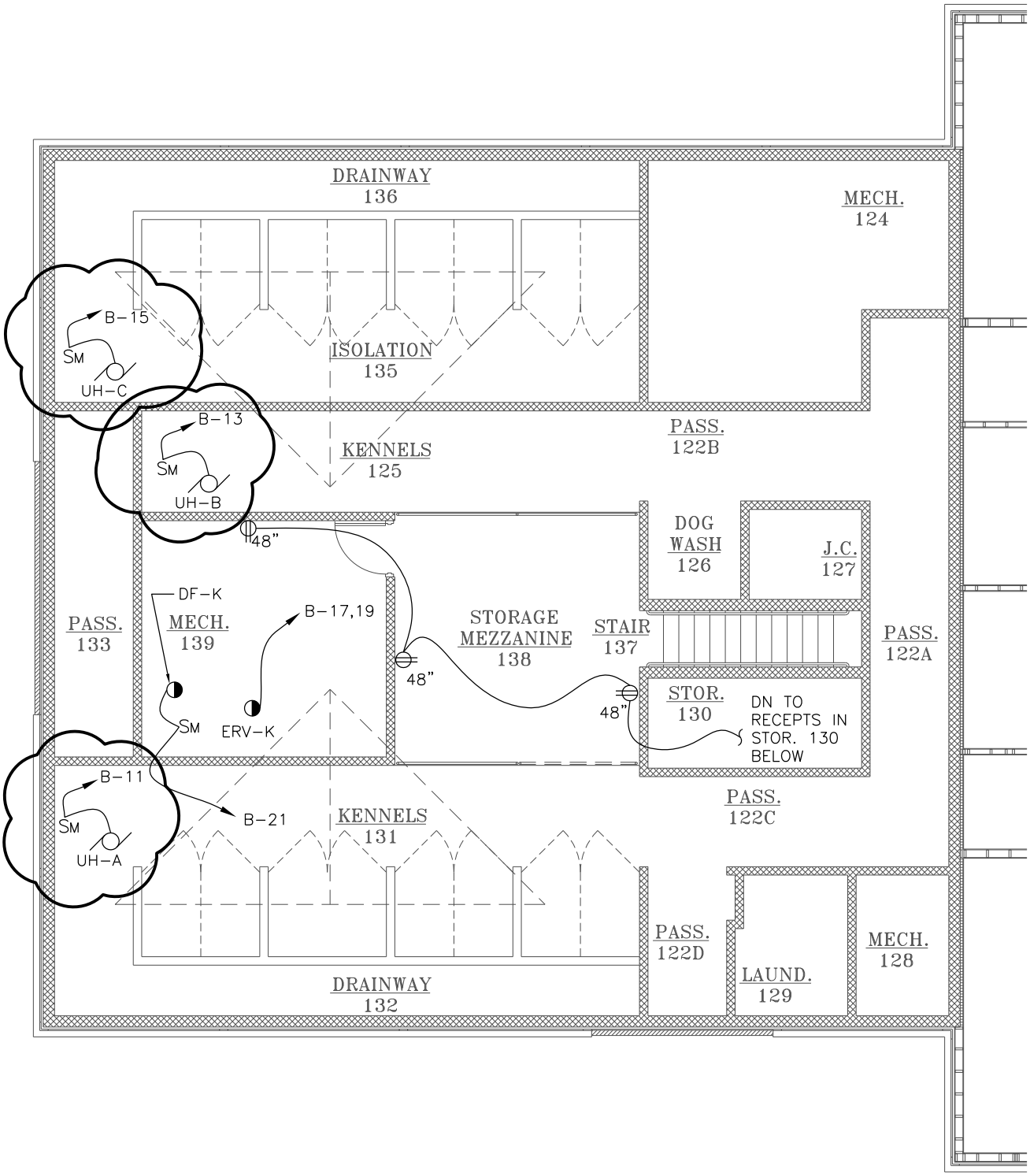

SKETCH SK-E2-1A

ADDENDUM #1 – MAY 2, 2011
NO SCALE

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04/27/2011 PRE-BID SIGN-IN SHEET

Anthony Esson, Architect
Gaylord, Michigan

April 14, 2011

Otsego County Animal Control Facility
Gaylord, Michigan

Project No. 0160-10

PRE-BID MEETING SIGN-IN

	Name	Company & Address	Phone, Fax, & Email Number
1.	Robert Ulrich	TNT Electric	231 946-3658 TNTElectrical@charter.com
2.	ERIC RENDER	RENDER CONSTRUCTION 2889 KNEELAND ST LEWISTON, MI, 49756	(989) 786 4801 F (989) 786 9753 e. renderconstruction@frontier.com
3.	DAVE WAKEFIELD	DAVID WAKEFIELD Const 7190 W Houghton LAKE DR Houghton LAKE, MI 48629	O-989 4226068 F 989 4226199 C 989 2335551 WAKE865@Hotmail.com
5.	Doug Stemler	MAVCON (GC) 9110 Portage Rd KALAMAZOO, MI 49002	P (269) 488 0044 F (269) 488 0045 E dstemler@mavconusa.com
6.	Richard R. Wagner	Integrity Construction Services 829 W. Main St. Suite C. Gaylord, MI 49735	P 989 705-1131 F 989 732-6102 rwagner@integrity-construction.com chunt@integrity-construction.com
7.	AL Towne	BALLARD'S + GREAT LAKES 2111 E. Mitchell RD Petoskey MI 49770	P 231-347-3900 F 231-347-4947 Atowne@BALLARDSGreatLakes.com
8.	Ryan Peters	Birchwood Construction Company 8920 Moeller Dr. Harbor Springs, MI 49740	P: 231-439-1633 F: 231-439-1631 E: ryanpeters@birchwoodconstruction.net

PRE-BID MEETING SIGN-IN

Name	Company & Address	Phone, Fax, & Email Number
9. Gino Bazzani	North Pointe Plbg & Htg P.O. Box 557 Gaylord, Mi. 49735	P. 989 731-0338 F. " 731-0337 gbazzani@northpointe-heating.com
10. DAVID C. LAURIA	EDWARDS ELECTRIC, INC. 3788 Old State Rd. BRUTUS, MI 49716	(231) 529 6347 (P) (231) 529 6347 (F) edwardselectric-co@hotmail.com
11. John Haggard	Haggards P&H (INC) PO Box 35 CVX, MI 49720	231 547 4046 231 547 0364 F haggardsinc@hotmail.com
12. BILL MASON	J&N, INC. P.O. Box 1518 GAYLORD, MI 49734	PH. 989-732-8318 FX: 989-731-1729 WMASON@JANDNINC.COM
13. MARVE DIRKSE	OWEN-AMES-KIMBALL.com 300 IONIA NW GR 49503-2507	616 262 4373 616 456 1512
14. Ben Kozlowski	Chets excavating 6599 Bechett RD Gaylord MI 49735	989-732-1039
15. BRYAN LAWTON	GRAND TRAVERSE CONST. 1616 SOUTH AIRPORT Rd TRAVERSE CITY MI 49686	231-929-1000 231-929-4435 FAX dpurgiel (EMAIL) @grandtraverseconstruction.com
Mike Mason	EARTHWORKS ENT, 6584 M-32 E. GAY. MICH, 49735	PH, 989-732-4343 FAX 989-731-6010
ROGER Fletcher	Petoskey Fence 3731 Cedar Valley Petoskey MI 49770	P231 347 8865 FAX 231 347 7430

PRE-BID MEETING SIGN-IN

Name	Company & Address	Phone, Fax, & Email Number
16. Petrie Const Jim Petrie		1-231-536-7063
17 Mike Ellwanger	Rieth-Riley	Mellwanger@rieth-riley.com 231-347-8862f 231-439-5757P
18. Dan Monette	Great Lakes Telecom	dmonette@glt.com 231-342-5732-cell 231-995-0300-office
19. Scott LeVassew	SUGAR CONSTRUCTION 2968 Venturo Dr Midland Mich	(989) 631 4154 Scott@sugar-Construction.com
20. Lee Thompson	4668 W-M-32 Gaylord Mi.	989-350-9081 Lee@Lee's AlpineFence.com
21. Curtis Russell	Graham Const. Inc. Saginaw MI	office 989 921 3030 fax 921 3031
22. DAN PATER	BURDCO INC 1222 VETERENS DR. T.C 49684	office 231-941-9074 fax 231-947-9135 dpater@burdco.com

23. Rick Townsend — North Central Excavating, P.O. Box 415, Gaylord, Mi, 49734. — 989-732-2125 P, 989-732-3745 FAX

24. JIM FISER — PROBUILD, P.O. BOX 306, GAYLORD, MI 49735 — 989-732-5136, 989-732-6903, JIM.FISER@PROBUILD.COM

27. JEFF FEDORINCHIK — HALLMARK CONSTRUCTION, 1874 CASS HARTMAN, T.C. MI 49685 — 231-946-1920 O, 231-946-1978 F, info@hallmarkTC.com

28. Terry Tobies — J&Q Coatings & Design, 586 Hayes Tower, Gaylord Mi 49735 — 989 732 4379, 989 390 2999

29. Mike Carnes — JP Heating of Northern Michigan, mcarnes@JPHeating.com — Ph 989-732-7571, FAX 989-732-3642

30. JOHN PYKE — WINDEMULLER ELECTRIC, 8580 COMMERCE CT., ~~[illegible]~~ HARBOR SPRINGS, MI 49740 — P: 231-439-0188, F: 231-439-0189

31. RUSSELL WARNER — CMA Design and Build, PO BOX 183392, Shelby Mi 48318 — P: 586-7261043, F: 586-726 6609

32. Todd Smith — Monahan/Summit, LLC, 4923 W. Dickman Rd., Battle Creek, MI 49037 — P: 269-441-3518, F: 269-441-1825, tsmithsbs@etsmail.net

Kris Gerke

Northshore Construction
8092 W. Hubert Rd
Hubbard Lake MI 49747

contactnorthshore@Gmail.com
989-727-4279 office
989-727 2679 fax
989-255-5120 cell

BID TABULATION

Anthony Esson, Architect
PO Box 479
Gaylord, Michigan

Otsego County
Animal Control Facility
Gaylord, Michigan

May 5, 2011

Project No. 0160-10

Bid Tabulation						
Bidder	**Base Bid**	**Contract Time (days)**	**Changes to Work (%)**		**Bid Security**	**Addenda**
			GC	**Sub**		
Burdco, Inc. Gaylord/Traverse City, MI	* $ 908,000.00	168	13	13	Y	Y
Hallmark Construction Traverse City, MI	$ 888,000.00	180	12	7	Y	Y
Integrity Construction Services Gaylord, MI	** $ 942,600.00	150	10	10	Y	Y
Monahan/Summit LLC Battle Creek, MI	$ 935,625.00	155	15	10	Y	Y
Petrie Construction Company East Jordan, MI	$ 935,807.00	180	10	10	Y	Y
Sugar Construction Midland, MI	$ 961,580.00	160	10	10	Y	Y
Mavcon Kalamazoo, MI	$ 995,159.00	135	10	10	Y	Y
Grand Traverse Construction Traverse City, MI	$ 997,000.00	240	10	8	Y	Y
Graham Construction, Inc. Saginaw, MI	$ 1,018,500.00	180	15	7.5	Y	Y
CMA Design and Build Shelby Twp., MI	$ 1,098,900.00	250	15	15	Y	Y

* Otsego County's purchasing policy provides for a 5% advantage to "Local Vendors" for purposes of determining low bid. For purposes of determining the low bidder under this policy, Burdco's equivalent bid would be $ 908,000.00 – ($ 908,000.00 x 5%) = $ 862,600.00. For purposes of determining Integrity Construction Services Bid under this policy, Integrity's equivalent Bid would be $ 942,600.00 – ($ 942,600 x 5%) = $ 895,470.00.