

PROJECT MANUAL

for

LTBB ODAWA INDIANS

MURRAY ROAD APARTMENT DEVELOPMENT

PROJECT NO. 273-19

May 1, 2020



**ANTHONY P. ESSON
ARCHITECT**

PO BOX 479

GAYLORD, MICHIGAN 49734

TELEPHONE: 989/732-0585

FAX: 480/772-4562

DOCUMENT 00 01 01

PROJECT TITLE PAGE

PROJECT NAME: LTBB ODAWA INDIANS
Government Center Archives Addition

OWNER: LTBB Odawa Indians
7500 Odawa Circle
Harbor Springs, MI 49740
Contact: Amanda Swiss, Planning Director
PH: (231) 242-1591

ARCHITECT: Anthony Esson, Architect

Mailing Address:
P.O. Box 479
Gaylord, MI 49734

Shipping Address:
2111 Forester Drive
Frederic, MI 49733

Contact: Anthony P. Esson, Architect, LEED AP
PH: (989) 732-0585
Email: tony@anthonyessonarchitect.com

MEP ENGINEER: JLK Engineering
5766 Catawaba Court
Gaylord, MI 49735
Contact: Justin Kowatch, PE
PH: (989) 448-4631
Email: jkowatch@jlkengineering.com

CIVIL ENGINEER: Wade Trim, Inc.
4241 Old US 27 S; Suite 1
Gaylord, MI 49735
Contact: Quinn Ridley, PE
PH: 989-732-3584
Email: qridley@wadetrim.com

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END OF SECTION

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INVITATION TO BID

Project:

Murray Road Apartment Development

Owner:

Little Traverse Bay Bands (LTBB) of Odawa Indians
7500 Odawa Circle
Harbor Springs, MI 49740

Architect/Engineer:

Anthony P. Esson, Architect
PO Box 479
Gaylord, MI 49734

Date: May 1, 2023

LTBB Odawa Indians will receive Bids from General Contract Bidders for construction of Apartment Building(s) at Niinaatig Way, Charlevoix, MI 49720.

Sealed Bids may be mailed or delivered in person to LTBB Odawa Indians, c/o Amanda Swiss, Planning Director; 7500 Odawa Circle, Harbor Springs, MI 49740. Bids must be received prior to 3:00 PM local time on June 28, 2023. Bids will be opened and read aloud immediately following closure of the bidding period in Room 312 of the Governmental Center located at 7500 Odawa Circle, Harbor Springs, MI 49740. The Owner will not consider or accept a bid received after the date and time specified for bid submission.

There will be a Pre-Bid Meeting conducted by the Owner and Architect/Engineer at 2:00 PM local time on June 15, 2023. The meeting will convene in the Administration Building Commons located at 7500 Odawa Circle, Harbor Springs, MI 49740. The Pre-Bid Meeting will consist of a brief informational meeting followed by an opportunity for Bidders to examine the Project site. Attendance by Bidders is mandatory. Attendance by Sub-bidders is not mandatory but is strongly encouraged.

Bidding Documents will be available on or about Friday, May 26, 2023. Bidding Documents will be available to Bidders in electronic format (.pdf) free of charge by emailing Shari Temple, Planning Assistant at stemple@ltbbodawa-nsn.gov with a request for Bidding Documents. Bidders notifying Shari Temple will be included on the Bidders List.

Bidding Documents will also be on file for inspection at the following locations:

LTBB Odawa Indians Planning Department
Builders Exchange Traverse City, Grand Rapids, Lansing, and Saginaw

A Bid security in the amount of 5 percent of the Bid Sum in the form of a Bid Bond shall accompany each Bid. A personal or company check does not constitute a Bid security.

The Project is subject to the Davis-Bacon Act and weekly payroll reporting.

The successful Bidder will be required to furnish Performance and Labor/Material Payment Bonds in the amount of 100% of the contract amount.

Bids will be required to be submitted under a condition of irrevocability for a period of 60 days after submission.

The Owner reserves the right to accept or reject any or all Bids, either in whole or in part; to award the Contract to other than the lowest Bidder; to waive any irregularities and/or informalities; and in general to make awards in any manner deemed to be in the best interest of the Owner.

Refer to other bidding requirements described in Document 00 21 13.

END OF DOCUMENT

DOCUMENT 00 21 13

INSTRUCTIONS TO BIDDERS

1.1 SUMMARY

A. Document Includes:

1. Bid submission.
2. Intent.
3. Work identified in contract documents.
4. Contract Time.
5. Definitions.
6. Contract Documents identification.
7. Availability of documents.
8. Examination of documents.
9. Inquiries and Addenda.
10. Product substitutions.
11. Site examination.
12. Prebid conference.
13. Bidder qualifications.
14. Subcontractors.
15. Submission procedure.
16. Bid ineligibility.
17. Davis-Bacon Requirements.
18. Build America, Buy America Act
19. Drug Free Workplace Requirements
20. Preference Policies
21. Non-procurement Debarment and Suspension
22. Certification of the Contractor.
23. Security deposit.
24. Performance Assurance.
25. Bid Form requirements.
26. Fees for changes in the Work.
27. Bid Form signature.
28. Additional bid information.
29. Selection and Award of Alternates
30. Bid opening.
31. Duration of offer.
32. Evaluation of Bids.
33. Acceptance of offer.

B. Related Documents:

1. Invitation to Bid.
2. Bid Form - Stipulated Price (Single-Prime Contract).
3. Document 00 45 03 – Non-procurement Debarment and Suspension.
4. Document 00 45 04 -
5. Form HUD-5369-A (11/92) Representations, Certifications, and Other Statements of Bidder.
6. AIA Document A101-2017, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment is a Stipulated Sum.
 - a. Definitions.
 - b. Contract Time identification.
 - c. Tax exempt procedures.

- d. Contractor's fees for changes.
 - e. Contractor's liability insurance.
 - f. Bond types and values.
 - g. Liquidated Damages
7. Form HUD-5370 General Conditions for Construction Contracts.

1.2 BID SUBMISSION

- A. Bids will be received by LTBB Odawa Indians, c/o Amanda Swiss, Planning Director; 7500 Odawa Circle, Harbor Springs, MI 49740 until 3:00 PM local time on June 28, 2023.
- B. Bids submitted after the above time will not be considered.
- C. Amendments to submitted Bids will be permitted when received in writing prior to bid closing and when endorsed by the same party or parties who signed and sealed the Bid.
- D. Bidders may withdraw their Bid by written request at any time before bid closing.

1.3 INTENT

- A. The intent of this Bid request is to obtain an offer to perform Work for a Stipulated Price contract, in accordance with Contract Documents.
- B. This Project is subject to a fixed limit of construction cost. It is the Owners intent to construct the site infrastructure and as many buildings as can constructed within the fixed limit of construction cost. As such, it is requested that Bidders submit separate Bids for specific portions of the work as follows:
 - 1. Site Infrastructure: Provide a Bid to construct site infrastructure including site grading; parking; curb and gutter; pavement marking; sanitary utility sewerage piping; storm utility drainage piping; and site restoration). Exclude sidewalks and base; excavation and backfill for buildings; construction of building pad (base); and other incidental work related directly to the construction of each building.
 - 2. Building 4: Provide a Bid to construct Building 4 including sidewalks and base; excavation and backfill for buildings, construction of building pad (base); and other incidental site work related directly to the construction of building 4.
 - 3. Building 3: Provide a Bid to construct Building 3 including sidewalks and base; excavation and backfill for buildings, construction of building pad (base); and other incidental site work related directly to the construction of building 3.
 - 4. Building 5: Provide a Bid to construct Building 5 including sidewalks and base; excavation and backfill for buildings, construction of building pad (base); and other incidental site work related directly to the construction of building 5.
 - 5. Building 6: Provide a Bid to construct Building 6 including sidewalks and base; excavation and backfill for buildings, construction of building pad (base); and other incidental site work related directly to the construction of building 6.

1.4 WORK IDENTIFIED IN CONTRACT DOCUMENTS

- A. Work of this proposed Contract comprises construction of Apartment Building(s), and associated site work.
- B. Location: Niinaatig Way, Charlevoix, MI 49720

1.5 CONTRACT TIME

- A. Indicate the number of days required until commencement of the work under Contract Time in the Bid Form.
- B. Indicate the number of calendar weeks required to achieve Substantial Completion of the work under Contract Time in the Bid Form. The Date of Substantial Completion in the Agreement shall be the Contract Time added to the commencement date.
- C. Contractor shall achieve Final Completion not later than sixty days following the Date of Substantial Completion.

1.6 DEFINITIONS

- A. Bidding Documents: Contract Documents supplemented with Invitation to Bid, Instructions to Bidders, Bid Form, and bid securities, identified.
- B. Contract Documents: Defined in AIA Document A201-2017 Article 1, including issued Addenda.
- C. Bid: Executed Bid Form and required attachments submitted in accordance with these Instructions to Bidders.
- D. Bid Price: Monetary Price identified by the Bidder in the Bid Form.

1.7 CONTRACT DOCUMENTS IDENTIFICATION

- A. The Contract Documents are identified as AEA Project No. 273-19; Murray Road Apartment Development for LTBB Odawa Indians; as prepared by Anthony Esson, Architect and identified in the Project Manual.

1.8 AVAILABILITY OF DOCUMENTS

- A. Bidding Documents may be obtained as stated in Invitation to Bid.
- B. Bidding Documents are made available only for the purpose of obtaining offers for this Project. Their use does not grant a license for other purposes.

1.9 EXAMINATION OF DOCUMENTS

- A. Bidders are responsible for full examination of the specifications and any addenda prior to submission of Bids.
- B. Bidding Documents are on display at the offices of the Owner and construction association plan room facilities as indicated in the Invitation to Bid.
- C. Upon receipt of Bidding Documents verify documents are complete. Notify Architect/Engineer if documents are incomplete.
- D. Immediately notify Architect/Engineer upon finding discrepancies or omissions in Bidding Documents.
- E. It 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. 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.

1.10 INQUIRIES AND ADDENDA

- A. In the case of a conflict or inconsistency in the Bidding Documents which should have reasonably been identified by the Bidder prior to Bid submission, and which was not brought to the attention of the Architect and clarified by Addendum prior to Bid submission, 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.
- B. Direct questions in writing to Anthony P. Esson, at the office of the Architect/Engineer; email at tony@anthonyessonarchitect.com.
- C. Verbal answers are not binding on any party.
- D. Submit questions not later than [month date, year]. Replies will be made by Addenda.
 - 1. Questions submitted after [month date, year] will not be responded to.
- E. Addenda may be issued during bidding period. Addenda will be posted on Owner's website and sent to construction association plan room facilities. Addenda become part of the Contract Documents. Include resultant costs in the Bid Price.

1.11 PRODUCT SUBSTITUTIONS

- A. 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 for products specified as "or equal" prior to the submission of Bids is not required and will not be acknowledged by the Architect.
- B. Where the Bidding Documents stipulate particular "Products" with no provisions for substitutions, substitutions will not be considered. The Architect will not acknowledge or respond to requests for substitutions for products specified "no substitutions" or "substitutions not permitted".
- C. Where Bidding Documents stipulate particular "Products" with provisions for substitutions, substitution requests will be considered by Architect/Engineer up to March 25, 2016.
 - 1. Substitution requests received after March 25, 2016 will not be responded to.
- D. With each substitution request, provide sufficient information for Architect/Engineer to determine acceptability of proposed products.
- E. When a request to substitute a Product is made, Architect/Engineer may approve the substitution. Approved substitutions will be identified by Addenda.
- F. In submission of substitutions to products specified, Bidders shall include in their Bid, changes required in the Work and changes to Contract Time and Contract Price to accommodate such approved substitutions. Later claims by the Bidder for an addition to the Contract Time or Contract Price because of changes in Work necessitated by use of substitutions will not be considered.

1.12 SITE EXAMINATION

- A. Examine Project site before submitting a Bid.

1.13 PREBID CONFERENCE

- A. A Pre-Bid Meeting conducted by the Owner and Architect/Engineer at 2:00 PM local time, June 15, 2023.
- B. The meeting will convene in the Administration Building Commons located at 7500 Odawa Circle, Harbor Springs, MI 49740.
- C. The Pre-Bid Meeting will consist of a brief informational meeting followed by an opportunity for Bidders to examine the Project site.
- D. Attendance by Bidders is mandatory. Attendance by Sub-bidders is not mandatory but is strongly encouraged.
- E. Representatives of the Owner and Architect/Engineer will be in attendance.
- F. Information relevant to Bidding Documents will be issued by Addendum.

1.14 BIDDER QUALIFICATIONS

- A. Qualification of the Bidder will be evaluated as provided in 1.33 of this section.
- B. Include resume's of key staff (Project Manager and Site Superintendent) that will be assigned to this project if awarded the contract with the Bid.
- C. Include a listing of similar projects complete by the Bidder and Owner/Architect references and current valid contact information with the Bid.
- D. Include a listing of any experience on past project for Little Traverse Bay Bands of Odawa Indians.

1.15 SUBCONTRACTORS

- A. The Owner reserves the right to reject a proposed Subcontractor for reasonable cause.
- B. Refer to AIA Document A201-2017, Article 5.

1.16 SUBMISSION PROCEDURE

- A. Bidders shall be solely responsible for delivery of Bids in manner and time prescribed.
- B. Submit one copy of executed offer on Bid Forms provided, signed and sealed with required security deposit in a closed opaque envelope, clearly identified with Bidder's name, Project name, and Owner's name on the outside.
- C. An abstract summary of submitted Bids will be made available to all Bidders following bid opening.

1.17 BID INELIGIBILITY

- A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may be declared unacceptable at Owner's discretion.
- B. Bid Forms, and enclosures which are improperly prepared may be declared unacceptable at Owner's discretion.
- C. Failure to provide security deposit, bonds or insurance requirements may invalidate the Bid at the discretion of the Owner.
- D. Bidders that are debarred, suspended or otherwise ineligible to receive Federal contracts are not eligible for contract award.

1.18 DAVIS-BACON REQUIREMENTS

- A. This project is subject to compliance with the Davis-Bacon Act and other provisions as provided in the Contract.
- B. Prevailing wage rates are as listed on the Department of Labor website (www.sam.gov/wage-determination/MI20230009/2) for corresponding classes of laborers employed on similar projects in the area and are listed in this contract (**MI20230009 04/07/2023** "Davis-Bacon Act Wage Determination").

1.19 BUILD AMERICA BUY AMERICA ACT

- A. To the greatest extent practicable, the Contractor shall purchase, acquire, and/or use goods, products and/or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section shall be included in all subawards including all contracts and purchase orders for work or products under this contract.
 - 1. "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.
 - 2. "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

1.20 DRUG FREE WORKPLACE REQUIREMENTS

- A. This project is subject to compliance with the Drug-Free Workplace Act (41 U.S.C. 701 – 707).

1.21 PREFERENCE POLICIES

- A. Award of this contract is subject to the Indian Preference Policy of the Little Traverse Bay Bands of Odawa Indians.
- B. Preference will be given to Indian Owned, Minority Owned, and Women Owned businesses as follows:
 - 1. Businesses owned by citizens of other Federally Recognized Indian Tribes, as certified by the Bureau of Indian Affairs.

2. Special consideration will also be given to firms proven to be minority owned, woman-owned and/or classified as a small business.
- C. Indian Owned businesses are defined as business with at least 51% ownership and control by person(s) of federally recognized Native American heritage. Include SBA and/or Tribal documentation with the Bid.
- D. Minority Owned or Women Owned Businesses are defined as businesses with at least 51% ownership and control by person(s) of a minority or women and so documented by SBA. Include SBA 8a documentation with the Bid.

1.22 NONPROCUREMENT DEBARMENT AND SUSPENSION

- A. Bidders that are debarred, suspended or otherwise ineligible to receive Federal contracts, certain subcontracts, and certain Federal financial and nonfinancial assistance and benefits, pursuant to the provisions of E.O. 12549, E.O. 12689, 2 CFR part 180, 48 CFR 9.404, and each agency's codification of the Common Rule for Nonprocurement Debarment and Suspension are not eligible for contract award.
- B. Bidders are required to submit with their Bid, Document 00 45 03 – Debarment, Suspension and Ineligibility Affidavit.

1.23 CERTIFICATIONS OF THE CONTRACTOR

- A. Bidders shall execute and submit Form HUD-5369-A (11/92) Representations, Certificates, and Other Statements of Bidders, with the Bid.
- B. Bidders shall execute and submit Document 00 45 04 – Non-Collusion Affidavit of Bidder, with the Bid.

1.24 SECURITY DEPOSIT

- A. Bids shall be accompanied by security deposit as follows:
 1. Bid Bond of a sum no less than 5 percent of the total Bid Price (including Site and Infrastructure and Buildings 4, 3, 5 and 6) on standard surety company form.
 2. Certified check in the amount of 5 percent of the total Bid Price (including Site and Infrastructure and Buildings 4, 3, 5 and 6).
- B. Endorse Bid Bond in name of the Owner as obligee, signed and sealed by the principal (Contractor) and surety.
- C. Endorse certified check in name of the Owner.
- D. Security deposits will be returned after execution of the Owner Contractor agreement.
- E. If no contract is awarded, security deposits will be returned.

1.25 PERFORMANCE ASSURANCE

- A. Accepted Bidder: Provide a Performance and Payment bond as described in the Contract.
- B. Include the cost of performance assurance bonds in each Bid Price.

1.26 BID FORM REQUIREMENTS

- A. Complete requested information in the Bid Form and Bid Form Supplements.
- B. Refer to AIA Document A201-2017, Article 3.6, procedures for sales tax exemption.

1.27 FEES FOR CHANGES IN THE WORK

- A. When the Architect/Engineer establishes that the method of valuation for Changes in the Work will be net cost plus a percentage fee in accordance with General Conditions, the percentage fee allowed for Overhead and Profit shall be Ten Percent (10%) on the net cost of work by the General Contractor, and Ten Percent (10%) on the gross cost of work by a Subcontractor.

1.28 BID FORM SIGNATURE

- A. Sign Bid Form, as follows:
 - 1. Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Insert the words "Sole Proprietor" under the signature. Affix seal.
 - 2. Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" under each signature. Affix seal to each signature.
 - 3. Corporation: Signature of a duly authorized signing officers in their normal signatures. Insert the officer's capacity in which the signing officer acts, under each signature. Affix the corporate seal. If the Bid is signed by officials other than the president and secretary of the company, or the president/secretary/treasurer of the company, submit a copy of the by-law resolution of their board of directors authorizing them to do so, with the Bid Form in the bid envelope.
 - 4. Joint Venture: Signature of each party of the joint venture under their respective seals in a manner appropriate to such party as described above, similar to requirements for Partnerships.

1.29 ADDITIONAL POST-BID INFORMATION

- A. Any Bidder shall, upon request of the Owner/Architect, complete and submit the following within 24 hours of Bid opening.
 - 1. List of Subcontractors: Include names of all Subcontractors and portions of the Work each Subcontractor will perform.

1.30 SELECTION AND AWARD OF ALTERNATES – Not Used

1.31 BID OPENING

- A. Bids will be opened and read aloud immediately following the closure of the bidding period.
- B. Location of Bid Opening: Room 312 of the Governmental Center located at 7500 Odawa Circle, Harbor Springs, MI 49740.
- C. The Owner will not consider or accept a bid received after the date and time specified for bid submission.

1.32 DURATION OF OFFER

- A. Bids shall remain open to acceptance and shall be irrevocable for a period of 60 days after bid closing date.

1.33 EVALUATION OF BIDS

- A. Bids will be evaluated on a “best value” basis including consideration for cost, Indian / minority preference, qualification of key staff, schedule, and past experience. Bids submitted will be scored based upon documentation submitted with the Bid and will be ranked by score.
- B. Bid Evaluation Criteria:
 - 1. Bids on Budget: Bids will ranked in order of cost (lowest to highest) and awarded points on a declining scale of 50, 45, 40, 35, 30, etc. points. Bids that exceed the Owner’s fixed limit of Construction Cost will be awarded 0 points.
 - 2. Ability to Commence Work: Bidders demonstrating the ability to commence work within 30 days will be awarded 5 points. Bidders that cannot commence work within thirty days will be awarded zero points.
 - 3. Duration to Completion: Bids will ranked in order of timeliness (shortest to longest) and awarded points on a declining scale of 15, 12, 9, 6, 3, 0 points.
 - 4. Staff Qualifications: Up to 10 points will be awarded based on the qualifications of key staff assigned to this project.
 - 5. Experience on Similar Projects: Up to 10 points will be awarded based upon the Bidders experience with similar projects.
 - 6. Experience with Little Traverse Bay Bands of Odawa Indians: 10 points will be awarded for a positive past experience, 5 points for a neutral past experience, and 0 points for a negative or no past experience.
 - 7. Indian Preference: 10 points will be awarded to Bidders that are Indian Owned.
 - 8. Minority / Women Preference: 5 points will be awarded to Bidders that are Minority or Women Owned.

1.34 ACCEPTANCE OF OFFER

- A. The Owner intends to award the contract to the highest scoring (“best value”) Bidder resulting from the bid evaluation process. The Owner reserves the right to accept or reject any or all offers.
- B. The Owner intends to award the contract including Site and Infrastructure, Building 4 and each other Building (3, 5 and 6) as can be constructed within the Owners fixed limit of construction cost.
- C. The award will be based upon the total cost of the combination of Site and Infrastructure, Building 4, and each other building (3, 5 and 6) as can be constructed with the Owners fixed limit of construction cost.
- D. After acceptance by the Owner, the Architect/Engineer on behalf of the Owner, will issue to the accepted Bidder, a written letter of Contract Award.
- E. Notwithstanding delay in the preparation and execution of the Agreement, accepted Bidder shall be prepared, upon written Notice to Proceed, to commence work within seven days following receipt of official written order of the Owner to proceed, or on date stipulated in such order.
- F. The accepted bidder shall, within 7 days following its presentation, execute Agreement and return it to the Owner.

END OF DOCUMENT

DOCUMENT 00 31 00

AVAILABLE PROJECT INFORMATION

1.1 SUMMARY

- A. Document Includes:
 - 1. Davis-Bacon Act Wage Determination

1.2 DAVIS-BACON ACT WAGE DETERMINATION

- A. A copy of Davis-Bacon Act Wage Determination **MI20230009 04/07/2023** is included with this document.
- B. This Wage Determination provides minimum wage rates and fringe benefits to be paid to any employee of a Contractor or Subcontractor (at any level) providing labor at the site.

END OF DOCUMENT

"General Decision Number: MI20230009 04/07/2023

Superseded General Decision Number: MI20220009

State: Michigan

Construction Type: Residential

Counties: Antrim, Benzie, Charlevoix, Emmet, Kalkaska, Leelanau, Manistee, Missaukee and Wexford Counties in Michigan.

RESIDENTIAL CONSTRUCTION PROJECTS (consisting of single family homes and apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

<p>If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:</p>	<ul style="list-style-type: none"> . Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least \$16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
<p>If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:</p>	<ul style="list-style-type: none"> . Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number Publication Date

0	01/06/2023
1	02/17/2023
2	04/07/2023

* BRMI0009-006 08/01/2022

	Rates	Fringes
BRICKLAYER.....	\$ 32.78	20.15

ELEC0498-002 06/01/2022

ANTRIM, BENZIE, CHARLEVOIX, EMMET (All Townships except Wawatan), KALKASKA, LEELANAU, MANISTEE, MISSAUKEE & WEXFORD COUNTIES

	Rates	Fringes
ELECTRICIAN.....	\$ 33.44	21.05

ELEC0692-014 06/01/2022

EMMETT (Township of Wawatan)

	Rates	Fringes
ELECTRICIAN.....	\$ 32.97	38.03%+9.25

ENGI0325-015 06/01/2022

MANISTEE COUNTY

	Rates	Fringes
OPERATOR: Power Equipment Backhoe/Excavator; Loader; Roller.....	\$ 38.18	24.85

PAID HOLIDAYS: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day.

ENGI0325-027 06/01/2022

REMAINING COUNTIES

	Rates	Fringes
OPERATOR: Power Equipment Backhoe/Excavator; Loader; Roller.....	\$ 38.18	24.85

PAID HOLIDAYS: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day.

LAB00355-006 06/01/2022

EXCLUDES OPEN CUT CONSTRUCTION

MANISTEE COUNTY

	Rates	Fringes
--	-------	---------

LABORER

Common or General; Mason
 Tender - Cement/Concrete....\$ 26.70 12.95

 LAB01098-019 07/01/2022

ANTRIM, BENZIE, CHARLEVOIX, EMMET, KALKASKA, LEELANAU,
 MISSAUKEE & WEXFORD COUNTIES

Rates Fringes

LABORER

Common or General; Mason
 Tender - Cement/Concrete....\$ 22.42 12.95

 PLUM0085-015 05/02/2016

ANTRIM, BENZIE, CHARLEVOIX, EMMET, KALKASKA, LEELANAU,
 MISSAUKEE & WEXFORD COUNTIES

Rates Fringes

PLUMBER (Including HVAC Pipe
 Installation).....\$ 22.47 8.92

 PLUM0174-011 07/01/2022

MANISTEE COUNTY

Rates Fringes

PLUMBER (Including HVAC Pipe
 Installation).....\$ 39.89 23.82

 ROOF0149-016 05/01/2021

Rates Fringes

ROOFER.....\$ 26.50 15.95

 SHEE0007-030 05/01/2018

Rates Fringes

SHEETMETAL WORKER (HVAC Duct
 and Unit Installation).....\$ 21.54 11.91

 * SUMI2010-007 09/16/2010

Rates Fringes

CARPENTER.....\$ 13.00 ** 3.79

CEMENT MASON/CONCRETE FINISHER...\$ 19.55 6.35

PAINTER: Brush Only.....\$ 13.44 ** 2.17

PAINTER: Spray.....\$ 14.36 ** 1.98

SHEET METAL WORKER, Excludes
 HVAC Duct and Unit
 Installation.....\$ 18.88 6.10

TRUCK DRIVER: Dump Truck.....\$ 12.00 ** 1.25

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$16.20) or 13658 (\$12.15). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal

process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====

END OF GENERAL DECISIO"

DOCUMENT 00 41 13

BID FORM - STIPULATED PRICE

To: LTBB Odawa Indians
c/o Amanda Swiss, Planning Director
7500 Odawa Circle
Harbor Springs, MI 49740

Project: LTBB ODAWA INDIANS
Murray Road Apartment Development
AEA Project No. 273-19

Date: _____

Submitted by: _____
(full name)

(full address) _____

Bidder Contact Information

(full name) _____

(telephone) _____

(email) _____

1.1 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 May 1, 2020 for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Price as follows:

A. To construct Site and Infrastructure:

\$ _____ (numerical)

\$ _____
dollars (written), in lawful money of the United States of America.

B. To construct Building 4 (in addition to the Bid to construction Site Infrastructure):

\$ _____ (numerical)

\$ _____
dollars (written), in lawful money of the United States of America.

C. To construct Building 3 (in addition to the Bid to construct Building 4 and Site Infrastructure):

\$ _____ (numerical)

\$ _____
dollars (written), in lawful money of the United States of America.

D. To construct Building 5 (in addition to the Bid to Construct Buildings 4 and 3, and Site Infrastructure):

\$ _____ (numerical)

\$ _____
dollars (written), in lawful money of the United States of America.

E. To construct Building 6 (in addition to the Bid to Construct Buildings 4, 3, and 5, and Site Infrastructure):

\$ _____ (numerical)

\$ _____
dollars (written), in lawful money of the United States of America.

We have included the cost of Performance and Labor/Material Payment Bonds in each Bid.

We have included the security deposit as required by the Instruction to Bidders.

We have included the cost of Wages and Benefits required under the Davis-Bacon Act.

We have completed and attached Certificates of the Bidder as required in Section 00 21 13:
Document 00 45 03 - Debarment, Suspension, and Ineligibility Affidavit
Document 00 45 04 - Non-collusion Affidavit of Bidder
Form HUD-5369-A (11/92) Representations, Certifications, and Other Statements of Bidders

We have not included Michigan Sales Tax as the project being Tribally Owned is exempt from Michigan Sales Tax under an agreement with the State of Michigan.

1.2 ACCEPTANCE

This offer shall be open to acceptance and is irrevocable for sixty 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 days of receipt of Notice of Award.
- Furnish the required bonds and insurances within seven days of receipt of Notice of Award.
- Commence work within seven days after execution of the agreement.

If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required bonds, the security deposit shall be forfeited as compensation to the Owner for Owners additional expenses, by reason of our failure.

In the event our bid is not accepted within the time stated above, the required security deposit will 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.

1.3 CONTRACT TIME

If this Bid is accepted, we can commence work within _____(____) calendar days.

If this Bid is accepted, we will achieve Substantial Completion of the work as follows:

- A. Site Infrastructure and Building 4: _____(____) calendar weeks from Notice to Proceed.
- B. Additional contract time required to construct Building 3 in addition to Site Infrastructure and Building 4: _____(____) calendar weeks from Notice to Proceed.
- B. Additional contract time required to construct Building 5 in addition to Site Infrastructure and Buildings 4 and 3: _____(____) calendar weeks from Notice to Proceed.
- B. Additional contract time required to construct Building 6 in addition to Site Infrastructure and Buildings 4, 3 and 5: _____(____) calendar weeks from Notice to Proceed.

We acknowledge that we must achieve Final Completion not later than Sixty (60) days following the date of Substantial Completion.

1.4 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 Price.

Addendum # _____ Dated _____

Addendum # _____ Dated _____

1.5 ADDITIONAL BID INFORMATION

Check each item listed below if included in the Bid.

____ Resumes of key staff (Project Manager, and Site Superintendent) are attached.

____ Listing of similar project experience and Owner references is attached.

____ Listing of experience on any LTBB Odawa Indians project(s) is attached.

____ Documentation of Native American Ownership is attached.

____ Documentation of Minority Ownership is attached.

In accordance with Instruction to Bidders, the following documents will be submitted within 24 hours of bid opening and made a condition of the Bid:

- Bidder's qualifications statement and supporting data (if requested by the Owner).
- List of Subcontractors (if requested by the Owner).

1.6 BID FORM SIGNATURES

Bidder - print the full name of your firm

Authorized signing officer

Title

Signature

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

END OF DOCUMENT

**U.S. Department of Housing
and Urban Development**
Office of Public and Indian Housing

**Representations, Certifications,
and Other Statements of Bidders**
Public and Indian Housing Programs

Representations, Certifications, and Other Statements of Bidders

Public and Indian Housing Programs

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1. Certificate of Independent Price Determination

(a) The bidder certifies that--

(1) The prices in this bid have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other bidder or competitor relating to (i) those prices, (ii) the intention to submit a bid, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this bid have not been and will not be knowingly disclosed by the bidder, directly or indirectly, to any other bidder or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a competitive proposal solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the bidder to induce any other concern to submit or not to submit a bid for the purpose of restricting competition.

(b) Each signature on the bid is considered to be a certification by the signatory that the signatory--

(1) Is the person in the bidder's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above.

_____ [insert full name of person(s) in the bidder's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the bidder's organization];

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above.

(c) If the bidder deletes or modifies subparagraph (a)2 above, the bidder must furnish with its bid a signed statement setting forth in detail the circumstances of the disclosure.

[] [Contracting Officer check if following paragraph is applicable]

(d) Non-collusive affidavit. (applicable to contracts for construction and equipment exceeding \$50,000)

(1) Each bidder shall execute, in the form provided by the PHA/IHA, an affidavit to the effect that he/she has not colluded with any other person, firm or corporation in regard to any bid submitted in response to this solicitation. If the successful bidder did not submit the affidavit with his/her bid, he/she must submit it within three (3) working days of bid opening. Failure to submit the affidavit by that date may render the bid nonresponsive. No contract award will be made without a properly executed affidavit.

(2) A fully executed "Non-collusive Affidavit" [] is, [] is not included with the bid.

2. Contingent Fee Representation and Agreement

(a) Definitions. As used in this provision:

"Bona fide employee" means a person, employed by a bidder and subject to the bidder's supervision and control as to time, place, and manner of performance, who neither exerts, nor proposes to exert improper influence to solicit or obtain contracts nor holds out as being able to obtain any contract(s) through improper influence.

"Improper influence" means any influence that induces or tends to induce a PHA/IHA employee or officer to give consideration or to act regarding a PHA/IHA contract on any basis other than the merits of the matter.

(b) The bidder represents and certifies as part of its bid that, except for full-time bona fide employees working solely for the bidder, the bidder:

(1) [] has, [] has not employed or retained any person or company to solicit or obtain this contract; and

(2) [] has, [] has not paid or agreed to pay to any person or company employed or retained to solicit or obtain this contract any commission, percentage, brokerage, or other fee contingent upon or resulting from the award of this contract.

(c) If the answer to either (a)(1) or (a)(2) above is affirmative, the bidder shall make an immediate and full written disclosure to the PHA/IHA Contracting Officer.

(d) Any misrepresentation by the bidder shall give the PHA/IHA the right to (1) terminate the contract; (2) at its discretion, deduct from contract payments the amount of any commission, percentage, brokerage, or other contingent fee; or (3) take other remedy pursuant to the contract.

3. Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions (applicable to contracts exceeding \$100,000)

(a) The definitions and prohibitions contained in Section 1352 of title 31, United States Code, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The bidder, by signing its bid, hereby certifies to the best of his or her knowledge and belief as of December 23, 1989 that:

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of a contract resulting from this solicitation;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the bidder shall complete and submit, with its bid, OMB standard form LLL, "Disclosure of Lobbying Activities;" and

(3) He or she will include the language of this certification in all subcontracts at any tier and require that all recipients of subcontract awards in excess of \$100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than \$10,000, and not more than \$100,000, for each such failure.

(d) Indian tribes (except those chartered by States) and Indian organizations as defined in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) are exempt from the requirements of this provision.

4. Organizational Conflicts of Interest Certification

The bidder certifies that to the best of its knowledge and belief and except as otherwise disclosed, he or she does not have any organizational conflict of interest which is defined as a situation in which the nature of work to be performed under this proposed contract and the bidder's organizational, financial, contractual, or other interests may, without some restriction on future activities:

- (a) Result in an unfair competitive advantage to the bidder; or,
- (b) Impair the bidder's objectivity in performing the contract work.

[] In the absence of any actual or apparent conflict, I hereby certify that to the best of my knowledge and belief, no actual or apparent conflict of interest exists with regard to my possible performance of this procurement.

5. Bidder's Certification of Eligibility

(a) By the submission of this bid, the bidder certifies that to the best of its knowledge and belief, neither it, nor any person or firm which has an interest in the bidder's firm, nor any of the bidder's subcontractors, is ineligible to:

(1) Be awarded contracts by any agency of the United States Government, HUD, or the State in which this contract is to be performed; or,

(2) Participate in HUD programs pursuant to 24 CFR Part 24.

(b) The certification in paragraph (a) above is a material representation of fact upon which reliance was placed when making award. If it is later determined that the bidder knowingly rendered an erroneous certification, the contract may be terminated for default, and the bidder may be debarred or suspended from participation in HUD programs and other Federal contract programs.

6. Minimum Bid Acceptance Period

(a) "Acceptance period," as used in this provision, means the number of calendar days available to the PHA/IHA for awarding a contract from the date specified in this solicitation for receipt of bids.

(b) This provision supersedes any language pertaining to the acceptance period that may appear elsewhere in this solicitation.

(c) The PHA/IHA requires a minimum acceptance period of [Contracting Officer insert time period] calendar days.

(d) In the space provided immediately below, bidders may specify a longer acceptance period than the PHA's/IHA's minimum requirement. The bidder allows the following acceptance period: calendar days.

(e) A bid allowing less than the PHA's/IHA's minimum acceptance period will be rejected.

(f) The bidder agrees to execute all that it has undertaken to do, in compliance with its bid, if that bid is accepted in writing within (1) the acceptance period stated in paragraph (c) above or (2) any longer acceptance period stated in paragraph (d) above.

7. Small, Minority, Women-Owned Business Concern Representation

The bidder represents and certifies as part of its bid/ offer that it --

(a) [] is, [] is not a small business concern. "Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding, and qualified as a small business under the criteria and size standards in 13 CFR 121.

(b) [] is, [] is not a women-owned business enterprise. "Women-owned business enterprise," as used in this provision, means a business that is at least 51 percent owned by a woman or women who are U.S. citizens and who also control and operate the business.

(c) [] is, [] is not a minority business enterprise. "Minority business enterprise," as used in this provision, means a business which is at least 51 percent owned or controlled by one or more minority group members or, in the case of a publicly owned business, at least 51 percent of its voting stock is owned by one or more minority group members, and whose management and daily operations are controlled by one or more such individuals. For the purpose of this definition, minority group members are:

(Check the block applicable to you)

- [] Black Americans
- [] Asian Pacific Americans
- [] Hispanic Americans
- [] Asian Indian Americans
- [] Native Americans
- [] Hasidic Jewish Americans

8. Indian-Owned Economic Enterprise and Indian Organization Representation (applicable only if this solicitation is for a contract to be performed on a project for an Indian Housing Authority)

The bidder represents and certifies that it:

(a) [] is, [] is not an Indian-owned economic enterprise. "Economic enterprise," as used in this provision, means any commercial, industrial, or business activity established or organized for the purpose of profit, which is at least 51 percent Indian owned. "Indian," as used in this provision, means any person who is a member of any tribe, band, group, pueblo, or community which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs and any "Native" as defined in the Alaska Native Claims Settlement Act.

(b) [] is, [] is not an Indian organization. "Indian organization," as used in this provision, means the governing body of any Indian tribe or entity established or recognized by such governing body. Indian "tribe" means any Indian tribe, band, group, pueblo, or

community including Native villages and Native groups (including corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native Claims Settlement Act, which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs.

9. Certification of Eligibility Under the Davis-Bacon Act (applicable to construction contracts exceeding \$2,000)

(a) By the submission of this bid, the bidder certifies that neither it nor any person or firm who has an interest in the bidder's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(b) No part of the contract resulting from this solicitation shall be subcontracted to any person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(c) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.

10. Certification of Nonsegregated Facilities (applicable to contracts exceeding \$10,000)

(a) The bidder's attention is called to the clause entitled **Equal Employment Opportunity** of the General Conditions of the Contract for Construction.

(b) "Segregated facilities," as used in this provision, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin because of habit, local custom, or otherwise.

(c) By the submission of this bid, the bidder certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The bidder agrees that a breach of this certification is a violation of the Equal Employment Opportunity clause in the contract.

(d) The bidder further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) prior to entering into subcontracts which exceed \$10,000 and are not exempt from the requirements of the Equal Employment Opportunity clause, it will:

- (1) Obtain identical certifications from the proposed subcontractors;
- (2) Retain the certifications in its files; and
- (3) Forward the following notice to the proposed subcontractors (except if the proposed subcontractors have submitted identical certifications for specific time periods):

Notice to Prospective Subcontractors of Requirement for Certifications of Nonsegregated Facilities

A Certification of Nonsegregated Facilities must be submitted before the award of a subcontract exceeding \$10,000 which is not exempt from the provisions of the Equal Employment Opportunity clause of the prime contract. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

Note: The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

11. Clean Air and Water Certification (applicable to contracts exceeding \$100,000)

The bidder certifies that:

(a) Any facility to be used in the performance of this contract [] is, [] is not listed on the Environmental Protection Agency List of Violating Facilities:

(b) The bidder will immediately notify the PHA/IHA Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the Environmental Protection Agency, indicating that any facility that the bidder proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and,

(c) The bidder will include a certification substantially the same as this certification, including this paragraph (c), in every nonexempt subcontract.

12. Previous Participation Certificate (applicable to construction and equipment contracts exceeding \$50,000)

(a) The bidder shall complete and submit with his/her bid the Form HUD-2530, "Previous Participation Certificate." If the successful bidder does not submit the certificate with his/her bid, he/she must submit it within three (3) working days of bid opening. Failure to submit the certificate by that date may render the bid nonresponsive. No contract award will be made without a properly executed certificate.

(b) A fully executed "Previous Participation Certificate" [] is, [] is not included with the bid.

13. Bidder's Signature

The bidder hereby certifies that the information contained in these certifications and representations is accurate, complete, and current.

(Signature and Date)

(Typed or Printed Name)

(Title)

(Company Name)

(Company Address)

DOCUMENT 00 45 03

NON-PROCUREMENT DEBARMENT AND SUSPENSION AFFIDAVIT

By signing and submitting this affidavit, Bidder certifies that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or excluded from receiving Federal contracts, certain subcontracts, and certain Federal financial and nonfinancial assistance and benefits, pursuant to the provisions of [2 CFR part 180](#), E.O. 12549, E.O. 12689, 48 CFR 9.404, and each agency's codification of the Common Rule for Nonprocurement Suspension and Debarment.

BIDDER:

By: _____

Its: _____

State of Michigan)
) SS
County of)

This instrument was acknowledged before me on the _____ day of _____, 20____, by

_____.

, Notary Public

_____, County, Michigan

My Commission Expires: _____

Acting in the County of: _____

END OF NON-PROCUREMENT DEBARMENT AND SUSPENSION AFFIDAVIT

DOCUMENT 00 45 04

NON-COLLUSION AFFIDAVIT OF BIDDER

_____, being the first duly sworn, deposes and says that:

1. He/she is _____ of _____
(Owner, partner, etc.) (Company)
the Bidder that has submitted the accompanying Bid;

2. He/she is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;

3. Such Bid is genuine and is not a collusive or sham Bid;

4. Neither the said Bidder nor any of its officers, partners, owners, subcontractors, agents, representatives, employees or parties in interest including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly, with any other Bidder, firm or person to submit a sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix price or prices in the attached Bid or of any other Bidder, or to fix overhead, profit or cost element of the bid price or the bid price of any other bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement and advantage against the owner of the property interested in the proposed contract;

5. No agents, representatives, or employees of the Little Traverse Bay Bands of Odawa Indians is directly or indirectly interested in the bid, or the work to which it relates, or in any portion of the profits thereof; and,

6. The price of prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees or parties in interest including this affiant;

7. The Bidder is not indebted to the Little Traverse Bay Bands of Odawa Indians in any form or manner.

By: _____

Its: _____

State of Michigan)
) SS
County of)

This instrument was acknowledged before me on the _____ day of _____, 200__, by

_____.

, Notary Public

_____, County, Michigan

My Commission Expires: _____

Acting in the County of: _____

DOCUMENT 00 52 14

AGREEMENT FORM - AIA STIPULATED SUM (SINGLE-PRIME CONTRACT)

1.1 SUMMARY

A. Document Includes:

1. Agreement.

B. Related Documents:

1. Document 00 72 14 - General Conditions - AIA Stipulated Sum (Single-Prime Contract).

1.2 AGREEMENT

A. AIA Document A101-2017, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment is a Stipulated Sum, as modified and included herein, forms the basis of Agreement between the Owner and Contractor.

END OF DOCUMENT



AIA® Document A101® – 2017

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)

Little Traverse Bay Bands of Odawa Indians
7500 Odawa Circle
Harbor Springs, MI 49770
Telephone: 231.242.1400

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

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

Architect’s Project No. 273-19
Little Traverse Bay Bands of Odawa Indians
Murray Road Apartment Project
Niinaatig Way, Charlevoix, MI 49720

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

Anthony Esson, Architect
PO Box 479
Gaylord, MI 49734
Telephone: 989.350.1827

The Owner and Contractor agree as follows.

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

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, 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.

TABLE OF ARTICLES

1	THE CONTRACT DOCUMENTS
2	THE WORK OF THIS CONTRACT
3	DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
4	CONTRACT SUM
5	PAYMENTS
6	DISPUTE RESOLUTION
7	TERMINATION OR SUSPENSION
8	MISCELLANEOUS PROVISIONS
9	ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A 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:

(Check one of the following boxes.)

- The date of this Agreement.
- A date set forth in a notice to proceed issued by the Owner.
- Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

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

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:

(Check one of the following boxes and complete the necessary information.)

[] Not later than () calendar days from the date of commencement of the Work.

[X] By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work

Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

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 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price
<u>None</u>	

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement. *(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)*

Item	Price	Conditions for Acceptance
<u>None</u>		

§ 4.3 Allowances, if any, included in the Contract Sum: *(Identify each allowance.)*

Item (Specifications Section)	Price
<u>Resilient Flooring(09 65 00)</u>	<u>\$5.00 / sq. ft.</u>
<u>Sheet Carpeting (09 68 16)</u>	<u>\$18.00 / sq. yd.</u>
<u>Residential Casework (12 35 53)</u>	<u>\$150.00 / lineal ft.</u>

§ 4.4 Unit prices, if any:

(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit (\$0.00)
<u>None</u>		

§ 4.5 Liquidated damages, if any:

(Insert terms and conditions for liquidated damages, if any.)

As determined in accordance with Article 6 of this agreement.

§ 4.6 Other:

(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

None

Init.

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: month.

§ 5.1.3 Provided that ~~an~~ a properly executed Application for Payment and supporting documents, is received by the Architect not later than the last day of a month, the Owner shall make payment of the amount certified 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 of the amount certified shall be made by the Owner not later than thirty (30) days after the Architect receives the ~~Application for Payment~~ properly executed Application for Payment and supporting documents.

(Federal, state or local laws may require payment within a certain period of time.)

§ 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 of values 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 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- .1 That portion of the Contract Sum properly allocable to completed Work;
- .2 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; and
- .3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- .5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

Ten percent (10%) on work completed (materials and labor) or stored (materials).

§ 5.1.7.1.1 The following items are not subject to retainage:

(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

Performance and Payment Bonds required under the Contract, and costs incurred by the Contractor for any permits required in connection with the work.

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:

(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

There shall be no reduction or limitation of retainage. Owner shall retain 10% on completed work through Substantial Completion.

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:

(Insert any other conditions for release of retainage upon Substantial Completion.)

The Owner shall retain an amount equal to two times (2x) the value of items included on the punch list as listed on the Certificate of Substantial Completion through final payment.

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 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 Article 12 of AIA Document A201–2017, 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:

§ 5.3 Interest

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.)

%

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the 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.)

Init.

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:

(Check the appropriate box.)

- Arbitration pursuant to Section 15.4 of AIA Document A201–2017
- Litigation in a court of competent jurisdiction
- Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, 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.

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 A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner’s convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:

(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner’s convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner’s representative:

(Name, address, email address, and other information)

Amanda Swiss, Planning Director
LTBB Odawa Indians
7500 Odawa Circle
Harbor Springs, MI 49770
Telephone: 231.242.1591
Email: ASwiss@LTBBODAWA-NSN.GOV

§ 8.3 The Contractor’s representative:

(Name, address, email address, and other information)

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

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™-2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™-2017 Exhibit A, and elsewhere in the Contract Documents.

~~§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201-2017, may be given in accordance with AIA Document E203™-2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:~~

~~(If other than in accordance with AIA Document E203-2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)~~

§ 8.7 Other provisions:

§ 8.7.1 HUD-5370

- .1 HUD-5370 (1/2014) General Conditions for Construction Contracts – Public Housing forms and AIA A201-2017 General Conditions of the Contract for Construction are the conditions of the contract. In the event of a conflict in the provisions of HUD-5370 and AIA A201-2017, the most stringent or restrictive provisions shall apply.
- .2 Part 48 of HUD-5370 (1/2014) Procurement of Recovered Materials does not apply.

§ 8.7.2 This project is subject to compliance with the Drug-Free Workplace Act (41 U.S.C. 701 – 707). Contractors shall cooperate with the Owner in compliance with the Act.

§ 8.7.3 Final Completion: Contractor shall achieve Final Completion not later than sixty (60) days after Substantial Completion.

§ 8.7.3 All contractors, including their employees, and subcontractors and their employees (at any level) that are sex offenders mandated to register that are working on sites under the jurisdiction of LTBB Odawa Indians are required to update their registry with LTBB Law Enforcement.

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A101™-2017, Standard Form of Agreement Between Owner and Contractor
- .2 AIA Document A101™-2017, Exhibit A, Insurance and Bonds
- .3 AIA Document A201™-2017, General Conditions of the Contract for Construction

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4 AIA Document E203™ 2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
 (Insert the date of the E203-2013 incorporated into this Agreement.) Applicable portions of HUD-5370 (1/2014) General Conditions for Construction Contracts – Public Housing Programs

5 Drawings

Number	Title	Date
<u>DRAWING SET 1 – BLDGS 3, 5, & 6</u>		<u>January 24, 2023</u>
<u>T</u>	<u>TITLE SHEET / PROJECT INFORMATION</u>	<u>September 14, 2022</u>
<u>A1.1</u>	<u>LOWER FLOR PLAN</u>	<u>September 14, 2022</u>
<u>A1.2</u>	<u>UPPER FLOOR PLAN</u>	<u>September 14, 2022</u>
<u>A1.3</u>	<u>FIRE SEPARATION PLANS</u>	<u>September 14, 2022</u>
<u>A2.1</u>	<u>LOWER FLOOR REFLECTED CEILING PLAN</u>	<u>September 14, 2022</u>
<u>A2.2</u>	<u>UPPER FLOOR REFLECTED CEILING PLAN</u>	<u>September 14, 2022</u>
<u>A3.1</u>	<u>EXTERIOR ELEVATIONS</u>	<u>September 14, 2022</u>
<u>A4.1</u>	<u>ROOM FINISH SCHEDULE AND INTERIOR ELEVATIONS</u>	<u>September 14, 2022</u>
<u>A5.1</u>	<u>DOOR AND WINDOW SCHEDULES AND DETAILS</u>	<u>September 14, 2022</u>
<u>A6.1</u>	<u>BUILDING SECTIONS "A-A", "B-B" & "C-C"</u>	<u>September 14, 2022</u>
<u>A6.2</u>	<u>TYPICAL STAIR SECTIONS AND BUILDING DETAILS</u>	<u>September 14, 2022</u>
<u>A7.1</u>	<u>TYPICAL WALL DETAILS</u>	<u>September 14, 2022</u>
<u>A8.1</u>	<u>BATHROOM PLANS AND ELEVATIONS</u>	<u>September 14, 2022</u>
<u>S1.0</u>	<u>STRUCTURAL DIAGRAMS AND NOTES</u>	<u>September 14, 2022</u>
<u>S1.1</u>	<u>FOUNDATION PLANS</u>	<u>September 14, 2022</u>
<u>S2.1</u>	<u>UPPER FLOOR FRAMING PLAN</u>	<u>September 14, 2022</u>
<u>S3.1</u>	<u>LOWER ROOF FRAMING PLAN</u>	<u>September 14, 2022</u>
<u>S3.2</u>	<u>UPPER ROOF FRAMING PLAN</u>	<u>September 14, 2022</u>
<u>S3.3</u>	<u>UPPER VALLEY SET PLAN</u>	<u>September 14, 2022</u>
<u>S4.1</u>	<u>STRUCTURAL DETAILS</u>	<u>September 14, 2022</u>
<u>P1.0</u>	<u>PLUMBING TITLE SHEET</u>	<u>September 14, 2022</u>
<u>P2.1</u>	<u>BELOW GRAD PLUMBING PLAN – LOWER FLOOR</u>	<u>September 14, 2022</u>
<u>P2.2</u>	<u>ABOVE GRADE PLUMBING PLAN – LOWER FLOOR</u>	<u>September 14, 2022</u>
<u>P2.3</u>	<u>ABOVE GRADE PLUMBING PLAN – UPPER FLOOR</u>	<u>September 14, 2022</u>
<u>P3.1</u>	<u>PLUMBING DETAILS</u>	<u>September 14, 2022</u>
<u>M1.0</u>	<u>MECHANICAL TITLE SHEET</u>	<u>September 14, 2022</u>
<u>M2.1</u>	<u>MECHANICAL PLAN – LOWER FLOOR</u>	<u>September 14, 2022</u>
<u>M2.2</u>	<u>MECHANICAL PLAN – UPPER FLOOR</u>	<u>September 14, 2022</u>
<u>M3.1</u>	<u>MECHANICAL DETAILS</u>	<u>September 14, 2022</u>
<u>E1.0</u>	<u>ELECTRICAL TITLE SHEET</u>	<u>September 14, 2022</u>
<u>E2.1</u>	<u>ELECTRICAL POWER PLAN – LOWER FLOOR</u>	<u>September 14, 2022</u>
<u>E2.2</u>	<u>ELECTRICAL POWER PLAN – UPPER FLOOR</u>	<u>September 14, 2022</u>
<u>E3.1</u>	<u>ELECTRICAL LIGHTING PLAN – LOWER FLOOR</u>	<u>September 14, 2022</u>
<u>E3.2</u>	<u>ELECTRICAL LIGHTING PLAN – UPPER FLOOR</u>	<u>September 14, 2022</u>

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<u>E4.1</u>	<u>ELECTRICAL DETAILS</u>	<u>September 14, 2022</u>
<u>E4.2</u>	<u>ELECTRICAL DETAILS</u>	<u>September 14, 2022</u>

**DRAWING SET 2 –
BLDGS 3, 5, & 6**

<u>T</u>	<u>TITLE SHEET / PROJECT INFORMATION</u>	<u>September 14, 2022</u>
<u>A1.1</u>	<u>LOWER FLOOR PLAN</u>	<u>September 14, 2022</u>
<u>A1.2</u>	<u>UPPER FLOOR PLAN</u>	<u>September 14, 2022</u>
<u>A1.3</u>	<u>FIRE SEPARATION PLANS</u>	<u>September 14, 2022</u>
<u>A2.1</u>	<u>LOWER FLOOR REFLECTED CEILING PLAN</u>	<u>September 14, 2022</u>
<u>A2.2</u>	<u>UPPER FLOOR REFLECTED CEILING PLAN</u>	<u>September 14, 2022</u>
<u>A3.1</u>	<u>EXTERIOR ELEVATIONS</u>	<u>September 14, 2022</u>
<u>A4.1</u>	<u>ROOM FINISH SCHEDULE AND INTERIOR ELEVATIONS</u>	<u>September 14, 2022</u>
<u>A5.1</u>	<u>DOOR AND WINDOW SCHEDULES AND DETAILS</u>	<u>September 14, 2022</u>
<u>A6.1</u>	<u>BUILDING SECTIONS "A-A", "B-B" & "C-C"</u>	<u>September 14, 2022</u>
<u>A6.2</u>	<u>TYPICAL STAIR SECTIONS AND BUILDING DETAILS</u>	<u>September 14, 2022</u>
<u>A7.1</u>	<u>TYPICAL WALL DETAILS</u>	<u>September 14, 2022</u>
<u>A8.1</u>	<u>BATHROOM PLANS AND ELEVATIONS</u>	<u>September 14, 2022</u>
<u>S1.0</u>	<u>STRUCTURAL DIAGRAMS AND NOTES</u>	<u>September 14, 2022</u>
<u>S1.1</u>	<u>FOUNDATION PLANS</u>	<u>September 14, 2022</u>
<u>S2.1</u>	<u>UPPER FLOOR FRAMING PLAN</u>	<u>September 14, 2022</u>
<u>S3.1</u>	<u>LOWER ROOF FRAMING PLAN</u>	<u>September 14, 2022</u>
<u>S3.2</u>	<u>UPPER ROOF FRAMING PLAN</u>	<u>September 14, 2022</u>
<u>S3.3</u>	<u>UPPER VALLEY SET PLAN</u>	<u>September 14, 2022</u>
<u>S4.1</u>	<u>STRUCTURAL DETAILS</u>	<u>September 14, 2022</u>
<u>P1.0</u>	<u>PLUMBING TITLE SHEET</u>	<u>September 14, 2022</u>
<u>P2.1</u>	<u>BELOW GRAD PLUMBING PLAN – LOWER FLOOR</u>	<u>September 14, 2022</u>
<u>P2.2</u>	<u>ABOVE GRADE PLUMBING PLAN – LOWER FLOOR</u>	<u>September 14, 2022</u>
<u>P2.3</u>	<u>ABOVE GRADE PLUMBING PLAN – UPPER FLOOR</u>	<u>September 14, 2022</u>
<u>P3.1</u>	<u>PLUMBING DETAILS</u>	<u>September 14, 2022</u>
<u>M1.0</u>	<u>MECHANICAL TITLE SHEET</u>	<u>September 14, 2022</u>
<u>M2.1</u>	<u>MECHANICAL PLAN – LOWER FLOOR</u>	<u>September 14, 2022</u>
<u>M2.2</u>	<u>MECHANICAL PLAN – UPPER FLOOR</u>	<u>September 14, 2022</u>
<u>M3.1</u>	<u>MECHANICAL DETAILS</u>	<u>September 14, 2022</u>
<u>E1.0</u>	<u>ELECTRICAL TITLE SHEET</u>	<u>September 14, 2022</u>
<u>E2.1</u>	<u>ELECTRICAL POWER PLAN – LOWER FLOOR</u>	<u>September 14, 2022</u>
<u>E2.2</u>	<u>ELECTRICAL POWER PLAN – UPPER FLOOR</u>	<u>September 14, 2022</u>
<u>E3.1</u>	<u>ELECTRICAL LIGHTING PLAN – LOWER FLOOR</u>	<u>September 14, 2022</u>
<u>E3.2</u>	<u>ELECTRICAL LIGHTING PLAN – UPPER FLOOR</u>	<u>September 14, 2022</u>
<u>E4.1</u>	<u>ELECTRICAL DETAILS</u>	<u>September 14, 2022</u>
<u>E4.2</u>	<u>ELECTRICAL DETAILS</u>	<u>September 14, 2022</u>

**DRAWING SET 3 –
SITE/CIVIL**

<u>T</u>	<u>TITLE SHEET / PROJECT INFORMATION</u>	<u>May 19, 2023</u>
<u>C1.0</u>	<u>EXISTING CONDITIONS AND</u>	<u>May 19, 2023</u>

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<u>C2.0</u>	<u>DEMOLITION PLAN</u>	<u>May 19, 2023</u>
<u>C2.1</u>	<u>SESC PLAN</u>	<u>May 19, 2023</u>
<u>C3.0</u>	<u>SESC DETAILS</u>	<u>May 19, 2023</u>
<u>C3.1</u>	<u>OVERALL SITE PLAN</u>	<u>May 19, 2023</u>
<u>C3.2</u>	<u>SITE PLAN</u>	<u>May 19, 2023</u>
<u>C4.0</u>	<u>SITE DETAILS</u>	<u>May 19, 2023</u>
<u>C5.0</u>	<u>GRADING PLAN</u>	<u>May 19, 2023</u>
<u>C5.1</u>	<u>UTILITY PLAN</u>	<u>May 19, 2023</u>
<u>C5.2</u>	<u>UTILITY PROFILES</u>	<u>May 19, 2023</u>
	<u>UTILITY DETAILS</u>	<u>May 19, 2023</u>

.6 Specifications

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<u>01 10 00</u>	<u>Summary</u>	<u>May 1, 2020</u>	<u>2</u>
<u>01 20 00</u>	<u>Price and Payment Procedures</u>	<u>May 1, 2020</u>	<u>5</u>
<u>01 30 00</u>	<u>Administrative Requirements</u>	<u>May 1, 2020</u>	<u>5</u>
<u>01 33 00</u>	<u>Submittal Procedures</u>	<u>May 1, 2020</u>	<u>5</u>
<u>01 40 00</u>	<u>Quality Requirements</u>	<u>May 1, 2020</u>	<u>4</u>
<u>01 50 00</u>	<u>Temporary Facilities and Controls</u>	<u>May 1, 2020</u>	<u>7</u>
<u>01 57 13</u>	<u>Temporary Erosion and Sedimentation Control</u>	<u>May 1, 2020</u>	<u>8</u>
<u>01 60 00</u>	<u>Product Requirements</u>	<u>May 1, 2020</u>	<u>3</u>
<u>01 70 00</u>	<u>Execution and Closeout Requirements</u>	<u>May 1, 2020</u>	<u>7</u>
<u>01 89 00</u>	<u>Site Construction Performance Requirements</u>	<u>May 1, 2020</u>	<u>13</u>
<u>02 41 00</u>	<u>Selective Demolition – General</u>	<u>May 1, 2020</u>	<u>13</u>
<u>03 10 00</u>	<u>Concrete Forming and Accessories</u>	<u>May 1, 2020</u>	<u>4</u>
<u>03 11 19</u>	<u>Insulating Concrete Forming</u>	<u>May 1, 2020</u>	<u>10</u>
<u>03 20 00</u>	<u>Concrete Reinforcing</u>	<u>May 1, 2020</u>	<u>2</u>
<u>03 30 00</u>	<u>Cast-in-Place Concrete</u>	<u>May 1, 2020</u>	<u>9</u>
<u>03 35 00</u>	<u>Concrete Finishing</u>	<u>May 1, 2020</u>	<u>3</u>
<u>03 39 00</u>	<u>Concrete Curing</u>	<u>May 1, 2020</u>	<u>2</u>
<u>05 52 00</u>	<u>Metal Railings</u>	<u>May 1, 2020</u>	<u>2</u>
<u>06 10 00</u>	<u>Rough Carpentry</u>	<u>May 1, 2020</u>	<u>5</u>
<u>06 17 53</u>	<u>Shop-Fabricated Wood Trusses</u>	<u>May 1, 2020</u>	<u>5</u>
<u>06 20 00</u>	<u>Finish Carpentry</u>	<u>May 1, 2020</u>	<u>3</u>
<u>06 40 00</u>	<u>Cellular PVC Column Covers</u>	<u>May 1, 2020</u>	<u>3</u>
<u>06 61 16</u>	<u>Solid Surfacing Fabrications</u>	<u>May 1, 2020</u>	<u>5</u>
<u>07 21 16</u>	<u>Blanket Insulation</u>	<u>May 1, 2020</u>	<u>3</u>
<u>07 21 26</u>	<u>Blown Insulation</u>	<u>May 1, 2020</u>	<u>2</u>
<u>07 26 00</u>	<u>Vapor Retarders</u>	<u>May 1, 2020</u>	<u>2</u>
<u>07 31 13</u>	<u>Asphalt Shingles</u>	<u>May 1, 2020</u>	<u>4</u>
<u>07 46 33</u>	<u>Plastic Siding</u>	<u>May 1, 2020</u>	<u>4</u>
<u>07 62 00</u>	<u>Sheet Metal Flashing and Trim</u>	<u>May 1, 2020</u>	<u>3</u>
<u>07 71 23</u>	<u>Manufactured Gutters and Downspouts</u>	<u>May 1, 2020</u>	<u>3</u>
<u>07 84 00</u>	<u>Firestopping</u>	<u>May 1, 2020</u>	<u>4</u>
<u>07 90 00</u>	<u>Joint Protection</u>	<u>May 1, 2020</u>	<u>4</u>
<u>08 12 13</u>	<u>Hollow Metal Frames</u>	<u>May 1, 2020</u>	<u>3</u>
<u>08 13 13</u>	<u>Hollow Metal Doors</u>	<u>May 1, 2020</u>	<u>3</u>
<u>08 16 00</u>	<u>Composite (Interior) Doors</u>	<u>May 1, 2020</u>	<u>5</u>
<u>08 16 13</u>	<u>Fiberglass (Entry) Doors</u>	<u>May 1, 2020</u>	<u>5</u>
<u>08 52 16</u>	<u>Plastic Clad Wood Windows</u>	<u>May 1, 2020</u>	<u>5</u>
<u>08 71 00</u>	<u>Door Hardware</u>	<u>May 1, 2020</u>	<u>6</u>
<u>09 21 16</u>	<u>Gypsum Board Assemblies</u>	<u>May 1, 2020</u>	<u>4</u>
<u>09 65 00</u>	<u>Resilient Flooring</u>	<u>May 1, 2020</u>	<u>3</u>
<u>09 68 16</u>	<u>Sheet Carpeting</u>	<u>May 1, 2020</u>	<u>4</u>
<u>09 90 00</u>	<u>Painting and Coating</u>	<u>May 1, 2020</u>	<u>6</u>
<u>10 14 19</u>	<u>Dimensional Letter Signage</u>	<u>May 1, 2020</u>	<u>2</u>

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User Notes:

<u>10 28 16</u>	<u>Bath Accessories</u>	<u>May 1, 2020</u>	<u>3</u>
<u>10 57 33</u>	<u>Closet and Utility Shelving</u>	<u>May 1, 2020</u>	<u>2</u>
<u>12 35 30</u>	<u>Residential Casework</u>	<u>May 1, 2020</u>	<u>3</u>
<u>21 00 01</u>	<u>General Fire Protection Requirements</u>	<u>May 1, 2020</u>	<u>10</u>
<u>21 05 00</u>	<u>Common Work Results for Fire Protection</u>	<u>May 1, 2020</u>	<u>7</u>
<u>21 05 53</u>	<u>Identification for Fire Suppression Piping and Equipment</u>	<u>May 1, 2020</u>	<u>2</u>
<u>21 13 00</u>	<u>Fire Suppression Sprinkler Systems</u>	<u>May 1, 2020</u>	<u>7</u>
<u>22 00 01</u>	<u>General Plumbing Requirements</u>	<u>May 1, 2020</u>	<u>10</u>
<u>21 05 19</u>	<u>Meters and Gages for Plumbing Piping</u>	<u>May 1, 2020</u>	<u>3</u>
<u>22 05 53</u>	<u>Identification for Plumbing Piping and Equipment</u>	<u>May 1, 2020</u>	<u>2</u>
<u>22 07 19</u>	<u>Plumbing Piping Insulation</u>	<u>May 1, 2020</u>	<u>5</u>
<u>22 07 21</u>	<u>Plumbing Piping Safety Covers</u>	<u>May 1, 2020</u>	<u>3</u>
<u>22 10 05</u>	<u>Plumbing Piping</u>	<u>May 1, 2020</u>	<u>9</u>
<u>22 10 06</u>	<u>Plumbing Piping Specialties</u>	<u>May 1, 2020</u>	<u>5</u>
<u>22 30 00</u>	<u>Plumbing Equipment</u>	<u>May 1, 2020</u>	<u>2</u>
<u>22 40 00</u>	<u>Plumbing Fixtures</u>	<u>May 1, 2020</u>	<u>5</u>
<u>23 00 01</u>	<u>General Mechanical Requirements</u>	<u>May 1, 2020</u>	<u>10</u>
<u>23 05 53</u>	<u>Identification for HVAC Systems and Equipment</u>	<u>May 1, 2020</u>	<u>2</u>
<u>23 05 93</u>	<u>Testing, Adjusting, and Balancing for HVAC</u>	<u>May 1, 2020</u>	<u>8</u>
<u>23 07 13</u>	<u>Duct Insulation</u>	<u>May 1, 2020</u>	<u>5</u>
<u>23 31 00</u>	<u>HVAC Ducts and Casings</u>	<u>May 1, 2020</u>	<u>4</u>
<u>23 33 00</u>	<u>Air Duct Accessories</u>	<u>May 1, 2020</u>	<u>5</u>
<u>23 34 23</u>	<u>HVAC Power Ventilators</u>	<u>May 1, 2020</u>	<u>2</u>
<u>23 37 00</u>	<u>Air Outlets and Inlets</u>	<u>May 1, 2020</u>	<u>2</u>
<u>23 81 01</u>	<u>Terminal Heat Transfer Units</u>	<u>May 1, 2020</u>	<u>2</u>
<u>23 81 13</u>	<u>Packaged Terminal Air-Conditioners</u>	<u>May 1, 2020</u>	<u>2</u>
<u>26 00 01</u>	<u>General Electrical Requirements</u>	<u>May 1, 2020</u>	<u>9</u>
<u>26 05 19</u>	<u>Low-Voltage Electrical Power Cables (600V and Less)</u>	<u>May 1, 2020</u>	<u>4</u>
<u>26 05 26</u>	<u>Grounding and Bonding for Electrical Systems</u>	<u>May 1, 2020</u>	<u>2</u>
<u>26 05 29</u>	<u>Hangers and Supports for Electrical Systems</u>	<u>May 1, 2020</u>	<u>2</u>
<u>26 05 34</u>	<u>Conduit</u>	<u>May 1, 2020</u>	<u>5</u>
<u>26 05 37</u>	<u>Boxes</u>	<u>May 1, 2020</u>	<u>3</u>
<u>26 05 53</u>	<u>Identification for Electrical Systems</u>	<u>May 1, 2020</u>	<u>2</u>
<u>26 24 16</u>	<u>Panelboards</u>	<u>May 1, 2020</u>	<u>5</u>
<u>26 27 01</u>	<u>Electrical Service Entrance</u>	<u>May 1, 2020</u>	<u>2</u>
<u>26 27 17</u>	<u>Equipment Wiring</u>	<u>May 1, 2020</u>	<u>2</u>
<u>26 27 26</u>	<u>Wiring Devices</u>	<u>May 1, 2020</u>	<u>6</u>
<u>26 28 13</u>	<u>Fuses</u>	<u>May 1, 2020</u>	<u>2</u>
<u>26 28 18</u>	<u>Enclosed Switches</u>	<u>May 1, 2020</u>	<u>2</u>
<u>26 51 00</u>	<u>Interior Lighting</u>	<u>May 1, 2020</u>	<u>3</u>
<u>26 56 00</u>	<u>Exterior Lighting</u>	<u>May 1, 2020</u>	<u>3</u>
<u>28 31 00</u>	<u>Fire Detections and Alarm</u>	<u>May 1, 2020</u>	<u>6</u>
<u>31 11 00</u>	<u>Clearing and Grubbing</u>	<u>May 1, 2020</u>	<u>3</u>
<u>31 22 00</u>	<u>Grading</u>	<u>May 1, 2020</u>	<u>7</u>
<u>31 23 13</u>	<u>Subgrade Preparation</u>	<u>May 1, 2020</u>	<u>11</u>
<u>31 23 16</u>	<u>Structural Excavation and Backfill</u>	<u>May 1, 2020</u>	<u>6</u>
<u>31 23 19</u>	<u>Dewatering</u>	<u>May 1, 2020</u>	<u>4</u>
<u>31 23 23</u>	<u>Trenching and Backfill</u>	<u>May 1, 2020</u>	<u>8</u>
<u>31 35 00</u>	<u>Slope Protection</u>	<u>May 1, 2020</u>	<u>13</u>
<u>32 11 23</u>	<u>Aggregate Base Courses</u>	<u>May 1, 2020</u>	<u>5</u>
<u>32 12 16</u>	<u>Bituminous Paving</u>	<u>May 1, 2020</u>	<u>24</u>
<u>32 13 15</u>	<u>Sidewalks and Driveways</u>	<u>May 1, 2020</u>	<u>7</u>
<u>32 17 23</u>	<u>Pavement Markings</u>	<u>May 1, 2020</u>	<u>5</u>

<u>32 92 19</u>	<u>Seeding</u>	<u>May 1, 2020</u>	<u>10</u>
<u>33 05 13</u>	<u>Manholes and Structures</u>	<u>May 1, 2020</u>	<u>8</u>
<u>33 30 00</u>	<u>Sanitary Utility Sewerage Piping</u>	<u>May 1, 2020</u>	<u>20</u>
<u>33 34 10</u>	<u>High Density Polyethylene Piping and Fittings</u>	<u>May 1, 2020</u>	<u>7</u>
<u>33 34 10.15</u>	<u>Leakage Testing for HDPE Piping</u>	<u>May 1, 2020</u>	<u>5</u>
<u>33 41 00</u>	<u>Storm Utility Drainage Piping</u>	<u>May 1, 2020</u>	<u>12</u>

.7 Addenda, if any:

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

.8 Other Exhibits:

(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

AIA Document E204™ 2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

The Sustainability Plan:

Title	Date	Pages
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Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
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.9 Other documents, if any, listed below:

(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™-2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

Accepted portions of Bidders Bid (Bid Form – Stipulated Price) and any documentation submitted with the Bid.

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

LTBB ODAWA INDIANS

CONTRACTOR NAME

OWNER *(Signature)*

CONTRACTOR *(Signature)*

Regina Gasco-Bentley Tribal Chairperson
(Printed name and title)

(Printed name and title)

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AIA® Document A101® – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the day of in the year
(In words, indicate day, month and year.)

for the following **PROJECT**:
(Name and location or address)

Little Traverse Bay Bands of Odawa Indians
Murray Road Apartment Project
Niinaatig Way, Charlevoix, MI 49720

THE OWNER:
(Name, legal status and address)

Little Traverse Bay Bands of Odawa Indians
7500 Odawa Circle, Harbor Springs, MI 49770

THE CONTRACTOR:
(Name, legal status and address)

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

This document is intended to be used in conjunction with AIA Document A201®–2017, General Conditions of the Contract for Construction. Article 11 of A201®–2017 contains additional insurance provisions.

TABLE OF ARTICLES

- A.1 GENERAL**
- A.2 OWNER’S INSURANCE**
- A.3 CONTRACTOR’S INSURANCE AND BONDS**
- A.4 SPECIAL TERMS AND CONDITIONS**

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER’S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor’s request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

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

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§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder’s risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner’s property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:

(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit
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§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect’s and Contractor’s services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:

(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit
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§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner’s occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.

The Owner shall purchase and maintain the insurance selected and described below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

- § A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance**, to reimburse the Owner for loss of use of the Owner’s property, or the inability to conduct normal operations due to a covered cause of loss.

- § A.2.4.2 Ordinance or Law Insurance**, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

- § A.2.4.3 Expediting Cost Insurance**, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

- § A.2.4.4 Extra Expense Insurance**, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

- § A.2.4.5 Civil Authority Insurance**, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

- § A.2.4.6 Ingress/Egress Insurance**, for loss due to the necessary interruption of the insured’s business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

- § A.2.4.7 Soft Costs Insurance**, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

- § A.2.5.1 Cyber Security Insurance** for loss to the Owner due to data security and privacy breach,

including costs of investigating a potential or actual breach of confidential or private information.
(Indicate applicable limits of coverage or other conditions in the fill point below.)

[] § A.2.5.2 Other Insurance
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage

Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 **Certificates of Insurance.** The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 **Deductibles and Self-Insured Retentions.** The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 **Additional Insured Obligations.** To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage 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 for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than One Million Dollars (\$ 1,000,000.00) each occurrence, Two Million Dollars (\$ 2,000,000.00) general aggregate, and Two Million Dollars (\$ 2,000,000.00) aggregate for products-completed operations hazard, providing coverage for claims including

- .1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
- .2 personal injury and advertising injury;
- .3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
- .4 bodily injury or property damage arising out of completed operations; and

Init.

.5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

- .1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
- .2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
- .3 Claims for bodily injury other than to employees of the insured.
- .4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.
- .5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
- .6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
- .7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.
- .8 Claims related to roofing, if the Work involves roofing.
- .9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
- .10 Claims related to earth subsidence or movement, where the Work involves such hazards.
- .11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than One Million Dollars (\$ 1,000,000.00) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than One Million Dollars (\$ 1,000,000.00) each accident, One Million Dollars (\$ 1,000,000.00) each employee, and One Million Dollars (\$ 1,000,000.00) policy limit.

§ A.3.2.7 ~~Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks~~

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than One Million Dollars (\$ 1,000,000.00) per claim and One Million Dollars (\$ 1,000,000.00) in the aggregate.

§ A.3.2.9 ~~If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than (\$) per claim and (\$) in the aggregate.~~

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than (\$) per claim and (\$) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than (\$) per claim and (\$) in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than (\$) per claim and (\$) in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.

(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

- [] **§ A.3.3.2.1** Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:
(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

- [] **§ A.3.3.2.2 Railroad Protective Liability Insurance**, with policy limits of not less than (\$) per claim and (\$) in the aggregate, for Work within fifty (50) feet of railroad property.

- [] **§ A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than (\$) per claim and (\$) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

- [] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

- [] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[] **§ A.3.3.2.6 Other Insurance**
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits
<u>Umbrella Liability</u>	<u>Five Million Dollars (\$5,000,000.00)</u>

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:

(Specify type and penal sum of bonds.)

Type	Penal Sum (\$0.00)
Payment Bond	<u>One Hundred Percent (100%) of the contract value.</u>
Performance Bond	<u>One Hundred Percent (100%) of the contract value.</u>

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:



STATE OF MICHIGAN
DEPARTMENT OF TREASURY
LANSING

GRETCHEN WHITMER
GOVERNOR

RACHAEL EUBANKS
STATE TREASURER

December 1, 2022

Ms. Regina Gasco-Bentley
Chairperson
Little Traverse Bay Bands of Odawa Indians
7500 Odawa Circle
Harbor Springs, MI 49740

Dear Chairperson Gasco-Bentley:

Letter of Authorization to Use Tribal Certificate of Exemption

The Michigan Department of Treasury acknowledges receipt of the Little Traverse Bay Bands of Odawa Indians' election to use *Tribal Certificates of Exemption* for **Tribal, Resident Tribal Member, and Tribal Entity** purchases as provided in the Tax Agreement between the State and the Tribe dated December 20, 2002.

The Michigan Department of Treasury issues this *Letter of Authorization* indicating that as of January 1, 2008, the **Tribe, its Resident Tribal Members, and Tribal Entities** are hereby authorized to use the *Tribal Certificate of Exemption* in accordance with the terms and conditions set forth in the Tax Agreement. This letter has been updated to reflect its continued use through the **calendar year 2023**.

A copy of this *Letter of Authorization* should be attached to all *Tribal Certificates of Exemption* that are authorized by the Tribe.

Very truly yours,

A handwritten signature in cursive script that reads "Julie Jensen".

Julie Jensen
Tribal Specialist

c: James Bransky, General Counsel

2023 Tribal Certificate of Exemption for Sales and Use Tax

Issued under authority of Public Act 616 of 2002. Filing is voluntary.

TO BE RETAINED IN THE SELLER'S RECORDS - DO NOT SEND TO TREASURY
READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.

NOTICE TO SELLER: Part 2 of this form lists the tribes that are authorized to use this certificate and indicates which tribes have authorized its Resident Tribal Members/Tribal Entities to use this form. This certificate is not valid unless it has a *Letter of Authorization* issued by the State of Michigan attached and is signed by an authorized tribal representative. This certificate is updated annually and may only be used for purchases made in the 2023 calendar year. Outdated certificates are not valid.

Where this box is checked the Resident Tribal Member may only receive a 50% exemption on their purchase.

PART 1: PURCHASER			
Check the purchaser status: <input checked="" type="checkbox"/> Tribe <input type="checkbox"/> Resident Tribal Member/Tribal Entity (RTM/TE)			
Purchaser Name*		Federal Employer Identification No. (FEIN) or TR No. or ME No.	
Little Traverse Bay Bands of Odawa Indians		38-3236295	
Purchaser's Street Address (Number, Street)		Social Security Number (Last 4 digits only)	
7500 Odawa Circle			
City or Town	State	ZIP Code	Tribal Member Number
Harbor Springs	MI	49740	

* (1) TRIBAL PURCHASER: Enter Tribe, Tribal Business, Police Dept., School, etc.; (2) RTM/TE PURCHASER: Enter First Name, MI and Last Name, or Tribal Business

PART 2: TRIBAL AFFILIATION		
Check the tribal affiliation of the purchaser:		Are RTM/TE authorized to use this Certificate of Exemption?
<input type="checkbox"/>	01 Bay Mills Indian Community.....	YES
<input type="checkbox"/>	02 Grand Traverse Band of Ottawa and Chippewa Indians.....	YES
<input type="checkbox"/>	03 Match-E-Be-Nash-She-Wish Band of Pottawatomi Indians (Gun Lake Tribe).....	YES
<input type="checkbox"/>	04 Hannahville Indian Community.....	YES
<input type="checkbox"/>	07 Little River Band of Ottawa Indians.....	YES
<input checked="" type="checkbox"/>	08 Little Traverse Bay Bands of Odawa.....	YES
<input type="checkbox"/>	09 Nottawaseppi Huron Band of Potawatomi Indians.....	YES
<input type="checkbox"/>	10 Pokagon Band of Potawatomi Indians.....	YES
<input type="checkbox"/>	11 Saginaw Chippewa Indian Tribe of Michigan.....	YES
<input type="checkbox"/>	12 Sault Ste. Marie Tribe of Chippewa Indians.....	YES

PART 3: SELLER	
Enter name and address of the seller:	

PART 4: PURCHASES	
Check items covered by this <i>Tribal Certificate of Exemption</i> and provide the following information for each:	
A: Tribal Purchases	
<input checked="" type="checkbox"/>	Tangible personal property acquired within the Tribe's Tribal and Trust Lands for use exclusively within the Tribe's Tribal and Trust Lands. <u>Item(s) To Be Acquired</u> tangible personal property such as supplies & equipment <u>Location Where Item(s) Will Be Used</u> all Tribal Government locations within the Tribe's Tribal and Trust Lands
<input checked="" type="checkbox"/>	Tangible personal property acquired for Tribal Governmental Function (see instructions). <u>Item(s) To Be Acquired</u> tangible personal property such as supplies & equipment <u>Governmental Function for the Item(s)</u> From the list as stated in Section III.A.1.b. from the LTBB/SOM Tax Agreement:

PART 4: TRIBAL AND RTM/TE PURCHASES (Cont.)

Check items covered by this *Tribal Certificate of Exemption* and provide the following information for each:

A: Tribal Purchases (Cont.)

Buses used for transporting passengers to and from a gaming facility.

Year, Make and Model of Vehicle(s)

Vehicle Identification Number

Treaty fishing. Enter a description of the item(s) to be acquired.

all supplies, equipment, and lodging

Affixation to real estate (see instructions).

Item(s) To Be Acquired

Physical Address of Real Estate

materials for construction, renovation or

real property owned by the Tribe or in federal Trust

improvement of the real property, such as building

for the Tribe that is also located within Tribal and

materials or supplies

Trust Lands

B: Resident Tribal Member/Tribal Entity Purchases

Affixation to real estate (see instructions).

Item(s) To Be Acquired

Physical Address of Real Estate

Personal use vehicles, recreational watercraft, snowmobiles and off-road vehicles.

Year, Make and Model of Vehicle

Vehicle Identification Number

Modular or mobile home to be used as a principal residence of a Resident Tribal Member.

Year, Make, Model, Size

Serial Number

Physical Address At Which Home Will Be Placed

Tangible personal property acquired for use in treaty fishing. Enter a description of the item(s) below.

PART 5: CERTIFICATION

The undersigned represents that he or she is authorized by the Tribe to execute this *Tribal Certificate of Exemption* and represents that he or she has reviewed the tax agreement between the Tribe and the State of Michigan and determined the Tribe, Resident Tribal Member or Tribal Entity is entitled to the exemption(s) claimed.

Signature of Authorized Tribal Representative

Hayden Hooper

Telephone Number

(231) 242-1584

Name and Title (Printed or Typed)

Hayden Hooper, Department of Commerce Director

Date Signed

12/15/2022

Instructions for Completing Form 3998, Tribal Certificate of Exemption for Sales and Use Tax

This certificate is to be used by tribes as well as Resident Tribal Members/Tribal Entities that have been authorized by their tribe to use them. Do not use this certificate if the exemption is a standard exemption (e.g., resale, industrial processing, etc.) which can be claimed on the *Michigan Sales and Use Tax Certificate of Exemption* (Form 3372).

Part 2 of this certificate lists the tribes that have elected to use these certificates and indicates which of those tribes have authorized their Resident Tribal Members/Tribal Entities to use these certificates.

An authorized tribal representative must sign this certificate and attach a *Letter of Authorization* which is addressed to the Tribe and issued by the State of Michigan. **This certificate is updated annually and may only be used for purchases made in the calendar year specified on the certificate.**

Where the 50% box is marked under the “Notice to Seller” on page one of the form, the presenting Resident Tribal Member may only receive an exemption equal to 50% of the calculated tax. This applies when a purchase is jointly titled to an RTM and a non-RTM. The remaining 50% of the tax should be collected and remitted to the State as usual.

The terms “Resident Tribal Member,” “Tribal Entity,” “Agreement Area,” “Governmental Function” and “Tribal and Trust Lands” are defined in the tax agreement between the tribe and the State of Michigan. This certificate is not intended to modify the terms of any tax agreement; a purchaser’s entitlement to an exemption is determined solely by the agreement between the appropriate tribe and the State of Michigan.

A copy of this certificate (including attachments) must be retained by the issuing Tribe and by the Resident Tribal Member/Tribal Entity, where applicable. The original certificate must be retained by the seller. *Do not send this certificate to the Department of Treasury.*

Line-By-Line Instructions

Items not listed here are explained on the form.

PART 1: Purchaser.

Tribal purchases are those made by the Tribe itself, a governmental subdivision of the Tribe (e.g. police department, health facility, etc.), or a business which is entirely owned by the Tribe. Tribal Entity purchases are those made by entities owned by more than one tribal member or the Tribe and one or more of its tribal members. Resident Tribal Member purchases are those made by a member of the Tribe designated in Part 2 whose principal residence is located within the Agreement Area designated in his or her Tribe’s tax agreement with the State of Michigan.

If the purchaser is the Tribe, enter the name and address of Instructions for Form 3998, Tribal Certificate of Exemption for Sales and Use Tax the Tribe, the governmental agency of the Tribe or the name of the tribal business and the Federal Employer Identification Number (FEIN), TR number or ME number. If the purchaser is a Resident Tribal Member, enter the first name, middle initial, last name, address, last 4 digits of the social security number, and Tribal Member Number of the individual. If the purchaser is a Tribal Entity, enter the name of the entity and the FEIN, TR number, or ME number.

PART 4: Tribal and RTM/TE Purchases

Affixation to real estate by a contractor. If an exemption is claimed under the terms of the agreement for tangible personal property to be affixed to real estate by a contractor:

- The name, address and identification number of the Tribe, Resident Tribal Member or Tribal Entity who owns the real property where the affixation will occur is to be provided as the purchaser in Part 1.
- The appropriate tribal affiliation is to be provided in Part 2.
- The name and address of the contractor is to be provided as the seller in Part 3.
- The appropriate affixation to real estate box in Part 4A or 4B is to be checked, and the requested information is to be provided.
- A subcontractor not identified on this certificate must complete Form 3372 indicating the basis for the exemption claim as “affixation to real estate under a tribal state tax agreement.”
- The contractor must complete and present this certificate, as well as Form 3372, if applicable, and the *Letter of Authorization* to the vendor/supplier of the tangible personal property that will be affixed to the real estate.
- The contractor must retain a copy of this certificate, Form 3372, if applicable, and the *Letter of Authorization*.
- The issuing Tribe is to retain a copy of this certificate, including all documentation submitted by a Resident Tribal Member/Tribal Entity to the Tribe in support of a request for authorization to use this certificate.
- The vendor supplying the materials to the contractor for affixation must retain the original *Tribal Certificate of Exemption*, the original copy of Form 3372, if applicable, and a copy of the *Letter of Authorization*.
- Construction projects spanning multiple years will require a new *Tribal Certificate of Exemption* at the beginning of each new year.

If you have questions, visit www.michigan.gov/taxes or call Tribal Affairs at 517- 241-2185.

DOCUMENT 00 72 14

GENERAL CONDITIONS

1.1 SUMMARY

- A. Document Includes:
 - 1. General Conditions.
- B. Related Documents:
 - 1. Document 00 52 14 - Agreement Form.

1.2 GENERAL CONDITIONS

- A. AIA Document A201-2017 General Conditions of the Contract for Construction, as modified and included herein, and form HUD-5370 (1/2014) General Conditions for Construction Contracts form the General Conditions of the Contract.
- B. In the event of a conflict between AIA A201-2017 and HUD-5370 the most stringent or most prohibitive provision shall apply.

END OF DOCUMENT



AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

Little Traverse Bay Bands of Odawa Indians
Murray Road Apartment Project
Niinaatig Way, Charlevoix, MI 49720

THE OWNER:

(Name, legal status and address)

Little Traverse Bay Bands of Odawa Indians
7500 Odawa Circle, Harbor Springs, MI 49770

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.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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Init.

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User Notes:

(1299800886)

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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 or proposal 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. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 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.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 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 retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and 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 the 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 suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, 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 suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document

G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

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 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 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.

§ 2.3.2 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.

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

§ 2.3.4 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.

§ 2.3.5 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.

§ 2.3.6 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.

§ 2.4 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.

§ 2.5 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 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 default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for 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. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

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 its 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.

§ 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 2.3.4, 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 submit 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, subject to Section 15.1.7, 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. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be 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 notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative 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.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 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.

§ 3.4.4 Build America Buy America

§ 3.4.4.1 To the greatest extent practicable, the Contractor shall purchase, acquire, and/or use goods, products and/or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section shall be included in all subawards including all contracts and purchase orders for work or products under this contract.

- .1 "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.
- .2 "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

§ 3.5 Warranty

§ 3.5.1 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.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Owner represents that this project is exempt for Michigan sales and use taxes under the provisions of the Tax Agreement between Little Traverse Bay Bands of Odawa Indians and the State of Michigan. The Contractor shall not pay Michigan sales and use taxes on materials that are purchased, used or acquired in the performance of this contract that will be consumed or otherwise not removed from the site. The Owner will provide the Contractor with exemption certificates and any other documentation needed to make tax exempt purchases. Contractor shall execute certificates provided and shall provide executed certificates to subcontractors and suppliers. The Contractor shall pay any and all other 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~~ The Owner 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. The Contractor shall assist the Owner in securing required permits from the Authority Having Jurisdiction (LTBB Odawa Indians Planning Department).

§ 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 14 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 that an equitable adjustment be made 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, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim 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.

§ 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 notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice 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 and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to

completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably 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, or fails to provide submittals in accordance with the approved 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 make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 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 how 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 the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect 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 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.

§ 3.12.10.1 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 be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately 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 and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and 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.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 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, 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, or patching shall be restored to the condition existing prior to the cutting, fitting, or 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 construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its 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 and 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 the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with 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 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 an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the 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 that would otherwise exist as to a party or person described in this Section 3.18.

§ 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 Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 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.

§ 4.2 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.

§ 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 promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) 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

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 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 13.4.2 and 13.4.3, whether or not the 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, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 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 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 order 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 Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 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 the 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.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice 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 for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, 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 that the Contractor, by these Contract 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; 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 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 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 term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 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 any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its 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 or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has 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 notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work 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. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 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 that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor 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.

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. The Contractor shall proceed promptly with changes in the Work, 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 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine 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 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 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .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, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 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.

§ 7.3.7 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.

§ 7.3.8 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 may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

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, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 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 (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended 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

§ 9.1.1 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.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the

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various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent 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. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and 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 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 encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that 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 (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole 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 in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. 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. 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 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 suppliers 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 either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

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

§ 9.5.4 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 supplier 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 Contractor shall reflect such payment on its next Application 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.

§ 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 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 and suppliers 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 or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to 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 or provided by 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, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 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' 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 shutdown, 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.

§ 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; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and 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 the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the 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 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 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. 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 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, (3) a written statement that the Contractor knows of no 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, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and 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, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance 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 the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 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, corrected, 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 the 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

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- .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;
- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a 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, a Subcontractor, or a Sub-subcontractor; 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 implement, 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 the owners and users of adjacent sites and utilities of the safeguards.

§ 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. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is 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.

§ 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, notice of the injury or damage, whether or not insured, shall be

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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 and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. 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 notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's 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 the material or substance or who are to perform the task of removal or safe containment of the 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 by the amount of the Contractor's reasonable additional costs of shutdown, 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 hazardous 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 hazardous 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 reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances 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 reimburse the Contractor for all cost and expense thereby incurred.

§ 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 Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract

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Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 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.

§ 11.1.4 **Notice of Cancellation or Expiration of Contractor's Required Insurance.** Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 **Failure to Purchase Required Property Insurance.** If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 **Notice of Cancellation or Expiration of Owner's Required Property Insurance.** Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 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; (2) the Architect and Architect's consultants; and (3) Separate Contractors, 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 those losses are covered by property insurance required by the

Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 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 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, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement 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 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

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, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before 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 any 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 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 2.5.

§ 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 of the Owner or Separate Contractors, whether completed or partially completed, 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.

§ 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, excluding that jurisdiction's choice of law rules. 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 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 the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 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.

§ 13.3.2 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 thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 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 tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 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 13.4.1, 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 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 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.

§ 13.4.5 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.

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

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties 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.

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, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, 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 reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, 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' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work 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' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 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 or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .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 reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner 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' 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 under 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 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 Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

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, a change in the Contract Time, 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. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the 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 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by 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 under this Section 15.1.3.1 shall 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.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 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.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 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.

§ 15.1.6.2 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.

§ 15.1.7 Waiver of 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 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, 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. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a 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.

§ 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 the 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 receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, 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 15.1.7, 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.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 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. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. 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 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party 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 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party 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 those of the Owner and Contractor under this Agreement.

General Conditions for Construction Contracts - Public Housing Programs

U.S. Department of Housing and Urban
Development
Office of Public and Indian Housing
OMB Approval No. 2577-0157 (exp. 11/30/2023)

**Applicability. This form is applicable to any
construction/development contract greater than \$250,000.**

Public reporting burden for this collection of information is estimated to average 1.0 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Comments regarding the accuracy of this burden estimate and any suggestions for reducing this burden can be sent to the Reports Management Officer, Office of Policy Development and Research, REE, Department of Housing and Urban Development, 451 7th St SW, Room 4176, Washington, DC 20410-5000. When providing comments, please refer to OMB Approval No. 2577-0157. This form includes those clauses required by OMB's common rule on grantee procurement, implemented at HUD in 2 CFR 200, and those requirements set forth in Section 3 of the Housing and Urban Development Act of 1968 and its amendment by the Housing and Community Development Act of 1992, implemented by HUD at 24 CFR Part 75. The form is required for construction contracts awarded by Public Housing Agencies (PHAs). The form is used by Housing Authorities in solicitations to provide necessary contract clauses. If the form were not used, PHAs would be unable to enforce their contracts. Responses to the collection of information are required to obtain a benefit or to retain a benefit. The information requested does not lend itself to confidentiality. HUD may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB number.

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1. Definitions

- (a) "Architect" means the person or other entity engaged by the PHA to perform architectural, engineering, design, and other services related to the work as provided for in the contract. When a PHA uses an engineer to act in this capacity, the terms "architect" and "engineer" shall be synonymous. The Architect shall serve as a technical representative of the Contracting Officer. The Architect's authority is as set forth elsewhere in this contract.
- (b) "Contract" means the contract entered into between the PHA and the Contractor. It includes the forms of Bid, the Bid Bond, the Performance and Payment Bond or Bonds or other assurance of completion, the Certifications, Representations, and Other Statements of Bidders (form HUD-5370), these General Conditions of the Contract for Construction (form HUD-5370), the applicable wage rate determinations from the U.S. Department of Labor, any special conditions included elsewhere in the contract, the specifications, and drawings. It includes all formal changes to any of those documents by addendum, change order, or other modification.
- (c) "Contracting Officer" means the person delegated the authority by the PHA to enter into, administer, and/or terminate this contract and designated as such in writing to the Contractor. The term includes any successor Contracting Officer and any duly authorized representative of the Contracting Officer also designated in writing. The Contracting Officer shall be deemed the authorized agent of the PHA in all dealings with the Contractor.
- (d) "Contractor" means the person or other entity entering into the contract with the PHA to perform all of the work required under the contract.
- (e) "Drawings" means the drawings enumerated in the schedule of drawings contained in the Specifications and as described in the contract clause entitled Specifications and Drawings for Construction herein.
- (f) "HUD" means the United States of America acting through the Department of Housing and Urban Development including the Secretary, or any other person designated to act on its behalf. HUD has agreed, subject to the provisions of an Annual Contributions Terms and Conditions (ACC), to provide financial assistance to the PHA, which includes assistance in financing the work to be performed under this contract. As defined elsewhere in these General Conditions or the contract documents, the determination of HUD may be required to authorize changes in the work or for release of funds to the PHA for payment to the Contractor. Notwithstanding HUD's role, nothing in this contract shall be construed to create any contractual relationship between the Contractor and HUD.
- (g) "Project" means the entire project, whether construction or rehabilitation, the work for which is provided for in whole or in part under this contract.
- (h) "PHA" means the Public Housing Agency organized under applicable state laws which is a party to this contract.
- (j) "Specifications" means the written description of the technical requirements for construction and includes the criteria and tests for determining whether the requirements are met.
- (l) "Work" means materials, workmanship, and manufacture and fabrication of components.

2. Contractor's Responsibility for Work

- (a) The Contractor shall furnish all necessary labor, materials, tools, equipment, and transportation necessary for performance of the work. The Contractor shall also furnish all necessary water, heat, light, and power not made available to the Contractor by the PHA pursuant to the clause entitled Availability and Use of Utility Services herein.
- (b) The Contractor shall perform on the site, and with its own organization, work equivalent to at least [] (12 percent unless otherwise indicated) of the total amount of work to be performed under the order. This percentage may be reduced by a supplemental agreement to this order if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the PHA.
- (c) At all times during performance of this contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the work site a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.
- (d) The Contractor shall be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence, and shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. The Contractor shall hold and save the PHA, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.
- (e) The Contractor shall lay out the work from base lines and bench marks indicated on the drawings and be responsible for all lines, levels, and measurements of all work executed under the contract. The Contractor shall verify the figures before laying out the work and will be held responsible for any error resulting from its failure to do so.
- (f) The Contractor shall confine all operations (including storage of materials) on PHA premises to areas authorized or approved by the Contracting Officer.
- (g) The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. After completing the work and before final inspection, the Contractor shall (1) remove from the premises all scaffolding, equipment, tools, and materials (including rejected materials) that are not the property of the PHA and all rubbish caused by its work; (2) leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer; (3) perform all specified tests; and, (4) deliver the installation in complete and operating condition.
- (h) The Contractor's responsibility will terminate when all work has been completed, the final inspection made, and the work accepted by the Contracting Officer. The Contractor will then be released from further obligation except as required by the warranties specified elsewhere in the contract.

3. Architect's Duties, Responsibilities, and Authority

- (a) The Architect for this contract, and any successor, shall be designated in writing by the Contracting Officer.

- (b) The Architect shall serve as the Contracting Officer's technical representative with respect to architectural, **Schedule** engineering, and design matters related to the work performed under the contract. The Architect may provide direction on contract performance. Such direction shall be within the scope of the contract and may not be of a nature which: (1) institutes additional work outside the scope of the contract; (2) constitutes a change as defined in the Changes clause herein; (3) causes an increase or decrease in the cost of the contract; (4) alters the Construction Progress Schedule; or (5) changes any of the other express terms or conditions of the contract.
- (c) The Architect's duties and responsibilities may include but shall not be limited to:
- (1) Making periodic visits to the work site, and on the basis of his/her on-site inspections, issuing written reports to the PHA which shall include all observed deficiencies. The Architect shall file a copy of the report with the Contractor's designated representative at the site;
 - (2) Making modifications in drawings and technical specifications and assisting the Contracting Officer in the preparation of change orders and other contract modifications for issuance by the Contracting Officer;
 - (3) Reviewing and making recommendations with respect to - (i) the Contractor's construction progress schedules; (ii) the Contractor's shop and detailed drawings; (iii) the machinery, mechanical and other equipment and materials or other articles proposed for use by the Contractor; and, (iv) the Contractor's price breakdown and progress payment estimates; and,
 - (4) Assisting in inspections, signing Certificates of Completion, and making recommendations with respect to acceptance of work completed under the contract.

4. Other Contracts

The PHA may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with PHA employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by PHA employees

Construction Requirements

5. Pre-construction Conference and Notice to Proceed

of the work, and that it has investigated and satisfied itself

- (a) Within ten calendar days of contract execution, and prior to the commencement of work, the Contractor shall attend a preconstruction conference with representatives of the PHA, its Architect, and other interested parties convened by the PHA. The conference will serve to acquaint the participants with the general plan of the construction operation and all other requirements of the contract. The PHA will provide the Contractor with the date, time, and place of the conference.
- (b) The contractor shall begin work upon receipt of a written Notice to Proceed from the Contracting Officer or designee. The Contractor shall not begin work prior to receiving such notice.

6. Construction Progress

- (a) The Contractor shall, within five days after the work commences on the contract or another period of time determined by the Contracting Officer, prepare and submit to the Contracting Officer for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring labor, materials, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. If the Contractor fails to submit a schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments or take other remedies under the contract until the Contractor submits the required schedule.
- (b) The Contractor shall enter the actual progress on the chart as required by the Contracting Officer, and immediately deliver three copies of the annotated schedule to the Contracting Officer. If the Contracting Officer determines, upon the basis of inspection conducted pursuant to the clause entitled Inspection and Acceptance of Construction, herein that the Contractor is not meeting the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer, without additional cost to the PHA. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.
- (c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the Contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the Default clause of this contract.

7. Site Investigation and Conditions Affecting the Work

- (a) The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location as to the general and local conditions which can affect the work or its cost, including but not limited to, (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads; (3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is

reasonably ascertainable from an inspection of the site, including all exploratory work done by the PHA, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the PHA.

(b) The PHA assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the PHA. Nor does the PHA assume responsibility for any understanding reached or representation made concerning conditions which can affect the work by any of its officers or agents before the execution of this contract, unless that understanding or representation is expressly stated in this contract.

8. Differing Site Conditions

- (a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of (1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or (2) unknown physical conditions at the site(s), of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract.
- (b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. Work shall not proceed at the affected site, except at the Contractor's risk, until the Contracting Officer has provided written instructions to the Contractor. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, the Contractor shall file a claim in writing to the PHA within ten days after receipt of such instructions and, in any event, before proceeding with the work. An equitable adjustment in the contract price, the delivery schedule, or both shall be made under this clause and the contract modified in writing accordingly.
- (c) No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required; provided, that the time prescribed in (a) above for giving written notice may be extended by the Contracting Officer.
- (d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

9. Specifications and Drawings for Construction

- (a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be

promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

- (b) Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription", of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean "approved by", or "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.
- (c) Where "as shown" "as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place" that is "furnished and installed".
- (d) "Shop drawings" means drawings, submitted to the PHA by the Contractor, subcontractor, or any lower tier subcontractor, showing in detail (1) the proposed fabrication and assembly of structural elements and (2) the installation (i.e., form, fit, and attachment details) of materials of equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the contract. The PHA may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.
- (e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with other contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the PHA's reasons therefore. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.
- (f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Architect approves any such variation and the Contracting Officer concurs, the Contracting Officer shall issue an appropriate modification to the contract, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.
- (g) It shall be the responsibility of the Contractor to make timely requests of the PHA for such large scale and full size drawings, color schemes, and other additional information, not already in his possession, which shall be

required in the planning and production of the work. Such requests may be submitted as the need arises, but each such request shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay.

- (h) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings, will be retained by the PHA and one set will be returned to the Contractor. As required by the Contracting Officer, the Contractor, upon completing the work under this contract, shall furnish a complete set of all shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the work is completed and accepted.
- (i) This clause shall be included in all subcontracts at any tier. It shall be the responsibility of the Contractor to ensure that all shop drawings prepared by subcontractors are submitted to the Contracting Officer.

10. As-Built Drawings

- (a) "As-built drawings," as used in this clause, means drawings submitted by the Contractor or subcontractor at any tier to show the construction of a particular structure or work as actually completed under the contract. "As-built drawings" shall be synonymous with "Record drawings."
- (b) As required by the Contracting Officer, the Contractor shall provide the Contracting Officer accurate information to be used in the preparation of permanent as-built drawings. For this purpose, the Contractor shall record on one set of contract drawings all changes from the installations originally indicated, and record final locations of underground lines by depth from finish grade and by accurate horizontal offset distances to permanent surface improvements such as buildings, curbs, or edges of walks.
- (c) This clause shall be included in all subcontracts at any tier. It shall be the responsibility of the Contractor to ensure that all as-built drawings prepared by subcontractors are submitted to the Contracting Officer.

11. Material and Workmanship

- (a) All equipment, material, and articles furnished under this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the contract to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of, and as approved by the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.
- (b) Approval of equipment and materials.
- (1) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the

machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

- (2) When required by the specifications or the Contracting Officer, the Contractor shall submit appropriately marked samples (and certificates related to them) for approval at the Contractor's expense, with all shipping charges prepaid. The Contractor shall label, or otherwise properly mark on the container, the material or product represented, its place of origin, the name of the producer, the Contractor's name, and the identification of the construction project for which the material or product is intended to be used.
- (3) Certificates shall be submitted in triplicate, describing each sample submitted for approval and certifying that the material, equipment or accessory complies with contract requirements. The certificates shall include the name and brand of the product, name of manufacturer, and the location where produced.
- (4) Approval of a sample shall not constitute a waiver of the PHA right to demand full compliance with contract requirements. Materials, equipment and accessories may be rejected for cause even though samples have been approved.
- (5) Wherever materials are required to comply with recognized standards or specifications, such specifications shall be accepted as establishing the technical qualities and testing methods, but shall not govern the number of tests required to be made nor modify other contract requirements. The Contracting Officer may require laboratory test reports on items submitted for approval or may approve materials on the basis of data submitted in certificates with samples. Check tests will be made on materials delivered for use only as frequently as the Contracting Officer determines necessary to insure compliance of materials with the specifications. The Contractor will assume all costs of retesting materials which fail to meet contract requirements and/or testing materials offered in substitution for those found deficient.
- (6) After approval, samples will be kept in the Project office until completion of work. They may be built into the work after a substantial quantity of the materials they represent has been built in and accepted.
- (c) Requirements concerning lead-based paint. The Contractor shall comply with the requirements concerning lead-based paint contained in the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. 4821-4846) as implemented by 24 CFR Part 35.

12. Permits and Codes

- (a) The Contractor shall give all notices and comply with all applicable laws, ordinances, codes, rules and regulations. Notwithstanding the requirement of the Contractor to comply with the drawings and specifications in the contract, all work installed shall comply with all applicable codes and regulations as amended by any

waivers. Before installing the work, the Contractor shall examine the drawings and the specifications for compliance with applicable codes and regulations bearing on the work and shall immediately report any discrepancy it may discover to the Contracting Officer.

Where the requirements of the drawings and specifications fail to comply with the applicable code or regulation, the Contracting Officer shall modify the contract by change order pursuant to the clause entitled Changes herein to conform to the code or regulation.

- (b) The Contractor shall secure and pay for all permits, fees, and licenses necessary for the proper execution and completion of the work. Where the PHA can arrange for the issuance of all or part of these permits, fees and licenses, without cost to the Contractor, the contract amount shall be reduced accordingly.

13. Health, Safety, and Accident Prevention

(a) In performing this contract, the Contractor shall:

- (1) Ensure that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his/her health and/or safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation;
- (2) Protect the lives, health, and safety of other persons;
- (3) Prevent damage to property, materials, supplies, and equipment; and,
- (4) Avoid work interruptions.

(b) For these purposes, the Contractor shall:

- (1) Comply with regulations and standards issued by the Secretary of Labor at 29 CFR Part 1926. Failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (Public Law 91-54, 83 Stat. 96), 40 U.S.C. 3701 et seq.; and
- (2) Include the terms of this clause in every subcontract so that such terms will be binding on each subcontractor.

(c) The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment, and shall report this data in the manner prescribed by 29 CFR Part 1904.

(d) The Contracting Officer shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the work, shall be deemed sufficient notice of the noncompliance and corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to take corrective action promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.

(e) The Contractor shall be responsible for its subcontractors' compliance with the provisions of this clause. The Contractor shall take such action with respect to any subcontract as the PHA, the Secretary of Housing and Urban Development, or the Secretary of Labor shall direct as a means of enforcing such provisions.

14. Temporary Heating

The Contractor shall provide and pay for temporary heating, covering, and enclosures necessary to properly protect all work and materials against damage by dampness and cold, to dry out the work, and to facilitate the completion of the work. Any permanent heating equipment used shall be turned over to the PHA in the condition and at the time required by the specifications.

15. Availability and Use of Utility Services

(a) The PHA shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to the PHA or, where the utility is produced by the PHA, at reasonable rates determined by the Contracting Officer. The Contractor shall carefully conserve any utilities furnished without charge.

(b) The Contractor, at its expense and in a manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of each utility used for the purpose of determining charges. Before final acceptance of the work by the PHA, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

16. Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements

(a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed under this contract, and which do not unreasonably interfere with the work required under this contract.

(b) The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during performance of this contract, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

(c) The Contractor shall protect from damage all existing improvements and utilities (1) at or near the work site and (2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. Prior to disturbing the ground at the construction site, the Contractor shall ensure that all underground utility lines are clearly marked.

(d) The Contractor shall shore up, brace, underpin, secure, and protect as necessary all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be affected by the excavations or other operations connected with the construction of the project.

(e) Any equipment temporarily removed as a result of work under this contract shall be protected, cleaned, and replaced in the same condition as at the time of award of this contract.

- (f) New work which connects to existing work shall correspond in all respects with that to which it connects and/or be similar to existing work unless otherwise required by the specifications.
- (g) No structural members shall be altered or in any way weakened without the written authorization of the Contracting Officer, unless such work is clearly specified in the plans or specifications.
- (h) If the removal of the existing work exposes discolored or unfinished surfaces, or work out of alignment, such surfaces shall be refinished, or the material replaced as necessary to make the continuous work uniform and harmonious. This, however, shall not be construed to require the refinishing or reconstruction of dissimilar finishes previously exposed, or finished surfaces in good condition, but in different planes or on different levels **Construction** when brought together by the removal of intervening work, unless such refinishing or reconstruction is specified in the plans or specifications.
- (i) The Contractor shall give all required notices to any adjoining or adjacent property owner or other party before the commencement of any work.
- (j) The Contractor shall indemnify and save harmless the PHA from any damages on account of settlement or the loss of lateral support of adjoining property, any damages from changes in topography affecting drainage, and from all loss or expense and all damages for which the PHA may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.
- (k) The Contractor shall repair any damage to vegetation, structures, equipment, utilities, or improvements, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

17. Temporary Buildings and Transportation of Materials

- (a) Temporary buildings (e.g., storage sheds, shops, offices, sanitary facilities) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the PHA. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.
- (b) The Contractor shall, as directed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any federal, state, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

18. Clean Air and Water

The contractor shall comply with the Clean Air Act, as amended, 42 USC 7401 et seq., the Federal Water Pollution Control Water Act, as amended, 33 U.S.C. 1251 et seq., and standards issued pursuant thereto in the facilities in which this contract is to be performed.

19. Energy Efficiency

The Contractor shall comply with mandatory standards and policies relating to energy efficiency which are contained in the energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Pub.L. 94-163) for the State in which the work under the contract is performed.

20. Inspection and Acceptance of

- (a) Definitions. As used in this clause -
- (1) "Acceptance" means the act of an authorized representative of the PHA by which the PHA approves and assumes ownership of the work performed under this contract. Acceptance may be partial or complete.
- (2) "Inspection" means examining and testing the work performed under the contract (including, when appropriate, raw materials, equipment, components, and intermediate assemblies) to determine whether it conforms to contract requirements.
- (3) "Testing" means that element of inspection that determines the properties or elements, including functional operation of materials, equipment, or their components, by the application of established scientific principles and procedures.
- (b) The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. All work is subject to PHA inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.
- (c) PHA inspections and tests are for the sole benefit of the PHA and do not: (1) relieve the Contractor of responsibility for providing adequate quality control measures; (2) relieve the Contractor of responsibility for loss or damage of the material before acceptance; (3) constitute or imply acceptance; or, (4) affect the continuing rights of the PHA after acceptance of the completed work under paragraph (j) below.
- (d) The presence or absence of the PHA inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specifications without the Contracting Officer's written authorization. All instructions and approvals with respect to the work shall be given to the Contractor by the Contracting Officer.
- (e) The Contractor shall promptly furnish, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. The PHA may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. The PHA shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.

- (f) The PHA may conduct routine inspections of the construction site on a daily basis.
- (g) The Contractor shall, without charge, replace or correct work found by the PHA not to conform to contract requirements, unless the PHA decides that it is in its interest to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.
- (h) If the Contractor does not promptly replace or correct rejected work, the PHA may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor, or (2) terminate for default the Contractor's right to proceed.
- (i) If any work requiring inspection is covered up without approval of the PHA, it must, if requested by the Contracting Officer, be uncovered at the expense of the Contractor. If at any time before final acceptance of the entire work, the **Construction PHA** considers it necessary or advisable, to examine work already completed by removing or tearing it out, the Contractor, shall on request, promptly furnish all necessary facilities, labor, and material. If such work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray all the expenses of the examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, the Contracting Officer shall make an equitable adjustment to cover the cost of the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.
- (j) The Contractor shall notify the Contracting Officer, in writing, as to the date when in its opinion all or a designated portion of the work will be substantially completed and ready for inspection. If the Architect determines that the state of preparedness is as represented, the PHA will promptly arrange for the inspection. Unless otherwise specified in the contract, the PHA shall accept, as soon as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines and designates can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or the PHA's right under any warranty or guarantee.

21. Use and Possession Prior to Completion

- (a) The PHA shall have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the PHA intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The PHA's possession or use shall not be deemed an acceptance of any work under the contract.
- (b) While the PHA has such possession or use, the Contractor shall be relieved of the responsibility for (1) the loss of or damage to the work resulting from the PHA's possession or use, notwithstanding the terms of the clause entitled Permits and Codes herein; (2) all maintenance costs on the areas occupied; and, (3) furnishing heat, light, power, and water used in the areas

occupied without proper remuneration therefore. If prior possession or use by the PHA delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

22. Warranty of Title

The Contractor warrants good title to all materials, supplies, and equipment incorporated in the work and agrees to deliver the premises together with all improvements thereon free from any claims, liens or charges, and agrees further that neither it nor any other person, firm or corporation shall have any right to a lien upon the premises or anything appurtenant thereto.

23. Warranty of

- (a) In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (j) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or workmanship performed by the Contractor or any subcontractor or supplier at any tier. This warranty shall continue for a period of _____ (one year unless otherwise indicated) from the date of final acceptance of the work. If the PHA takes possession of any part of the work before final acceptance, this warranty shall continue for a period of (one year unless otherwise indicated) from the date that the PHA takes possession.
- (b) The Contractor shall remedy, at the Contractor's expense, any failure to conform, or any defect. In addition, the Contractor shall remedy, at the Contractor's expense, any damage to PHA-owned or controlled real or personal property when the damage is the result of—
 - (1) The Contractor's failure to conform to contract requirements; or
 - (2) Any defects of equipment, material, workmanship or design furnished by the Contractor.
- (c) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for (one year unless otherwise indicated) from the date of repair or replacement.
- (d) The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect or damage.
- (e) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the PHA shall have the right to replace, repair or otherwise remedy the failure, defect, or damage at the Contractor's expense.
- (f) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall:
 - (1) Obtain all warranties that would be given in normal commercial practice;
 - (2) Require all warranties to be executed in writing, for the benefit of the PHA; and,
 - (3) Enforce all warranties for the benefit of the PHA.
- (g) In the event the Contractor's warranty under paragraph (a) of this clause has expired, the PHA may bring suit at its own expense to enforce a subcontractor's, manufacturer's or supplier's warranty.

- (h) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defect of material or design furnished by the PHA nor for the repair of any damage that results from any defect in PHA furnished material or design.
- (i) Notwithstanding any provisions herein to the contrary, the establishment of the time periods in paragraphs (a) and (c) above relate only to the specific obligation of the Contractor to correct the work, and have no relationship to the time within which its obligation to comply with the contract 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 its obligation other than specifically to correct the work.
- (j) This warranty shall not limit the PHA's rights under the Inspection and Acceptance of Construction clause of this contract with respect to latent defects, gross mistakes or fraud.

24. Prohibition Against Liens

The Contractor is prohibited from placing a lien on the PHA's property. This prohibition shall apply to all subcontractors at any tier and all materials suppliers.

Administrative Requirements

25. Contract Period

this contract within _____ calendar days of the effective date of the contract, or within the time schedule established in the notice to proceed issued by the Contracting Officer.

26. Order of Provisions

accordance with the terms and conditions of the

In the event of a conflict between these General Conditions and the Specifications, the General Conditions shall prevail. In the event of a conflict between the contract and any applicable state or local law or regulation, the state or local law or regulation shall prevail; provided that such state or local law or regulation does not conflict with, or is less restrictive than applicable federal law, regulation, or Executive Order. In the event of such a conflict, applicable federal law, regulation, and Executive Order shall prevail.

27. Payments

- (a) The PHA shall pay the Contractor the price as provided in this contract.
- (b) The PHA shall make progress payments approximately every 30 days as the work proceeds, on estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer. The PHA may, subject to written determination and approval of the Contracting Officer, make more frequent payments to contractors which are qualified small businesses.
- (c) Before the first progress payment under this contract, the Contractor shall furnish, in such detail as requested by the Contracting Officer, a breakdown of the total contract price showing the amount included therein for each principal category of the work, which shall substantiate the payment amount requested in order to provide a

basis for determining progress payments. The breakdown shall be approved by the Contracting Officer and must be acceptable to HUD. If the contract covers more than one project, the Contractor shall furnish a separate breakdown for each. The values and quantities employed in making up this breakdown are for determining the amount of progress payments and shall not be construed as a basis for additions to or deductions from the contract price. The Contractor shall prorate its overhead and profit over the construction period of the contract.

- (d) The Contractor shall submit, on forms provided by the PHA, periodic estimates showing the value of the work performed during each period based upon the approved submitted not later than _____ days in advance of the date set for payment and are subject to correction and revision as required. The estimates must be approved by the Contracting Officer with the concurrence of the Architect prior to payment. If the contract covers more than one project, the Contractor shall furnish a separate progress payment estimate for each.
- (e) Along with each request for progress payments and the required estimates, the Contractor shall furnish the following certification, or payment shall not be made: I hereby certify, to the best of my knowledge and belief, that:

- (1) The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the contract;
- (2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements; and,
- (3) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in subcontract.

Name:

Title:

Date:

- (f) Except as otherwise provided in State law, the PHA shall retain ten (10) percent of the amount of progress payments until completion and acceptance of all work under the contract; except, that if upon completion of 50 percent of the work, the Contracting Officer, after consulting with the Architect, determines that the Contractor's performance and progress are satisfactory, the PHA may make the remaining payments in full for the work subsequently completed. If the Contracting Officer subsequently determines that the Contractor's performance and progress are unsatisfactory, the PHA shall reinstate the ten (10) percent (or other percentage as provided in State law) retainage until such time as the Contracting Officer determines that performance and progress are satisfactory.
- (g) The Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration when computing progress payments.

Material delivered to the Contractor at locations other than the site may also be taken into consideration if the Contractor furnishes satisfactory evidence that (1) it has acquired title to such material; (2) the material is properly stored in a bonded warehouse, storage yard, or similar suitable place as may be approved by the Contracting Officer; (3) the material is insured to cover its full value; and (4) the material will be used to perform this contract. Before any progress payment which includes delivered material is made, the Contractor shall furnish such documentation as the Contracting Officer may require to assure the protection of the PHA's interest in such materials. The Contractor shall remain responsible for such stored material notwithstanding the transfer of title to the PHA.

- (h) All material and work covered by progress payments made shall, at the time of payment become the sole property of the PHA, but this shall not be construed as (1) relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or, (2) waiving the right of the PHA to require the fulfillment of all of the terms of the contract. In the event the work of the Contractor has been damaged by other contractors or persons other than employees of the PHA in the course of their employment, the Contractor shall restore such damaged work without cost to the PHA and to seek redress for its damage only from those who directly caused it.
- (i) The PHA shall make the final payment due the Contractor under this contract after (1) completion and final acceptance of all work; and (2) presentation of release of all claims against the PHA arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. Each such exception shall embrace no more than one claim, the basis and scope of which shall be clearly defined. The amounts for such excepted claims shall not be included in the request for final payment. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned.
- (j) Prior to making any payment, the Contracting Officer may require the Contractor to furnish receipts or other evidence of payment from all persons performing work and supplying material to the Contractor, if the Contracting Officer determines such evidence is necessary to substantiate claimed costs.
- (k) The PHA shall not; (1) determine or adjust any claims for payment or disputes arising there under between the Contractor and its subcontractors or material suppliers; or, (2) withhold any moneys for the protection of the subcontractors or material suppliers. The failure or refusal of the PHA to withhold moneys from the Contractor shall in nowise impair the obligations of any surety or sureties under any bonds furnished under this contract.

28. Contract Modifications

- (a) Only the Contracting Officer has authority to modify any term or condition of this contract. Any contract modification shall be authorized in writing.
- (b) The Contracting Officer may modify the contract unilaterally (1) pursuant to a specific authorization stated in a contract clause (e.g., Changes); or (2) for administrative matters which do not change the rights or

responsibilities of the parties (e.g., change in the PHA address). All other contract modifications shall be in the form of supplemental agreements signed by the Contractor and the Contracting Officer.

- (c) When a proposed modification requires the approval of HUD prior to its issuance (e.g., a change order that exceeds the PHA's approved threshold), such modification shall not be effective until the required approval is received by the PHA.

29. Changes

- (a) The Contracting Officer may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract including changes:
 - (1) In the specifications (including drawings and designs);
 - (2) In the method or manner of performance of the work;
 - (3) PHA-furnished facilities, equipment, materials, services, or site; or,
 - (4) Directing the acceleration in the performance of the work.
- (b) Any other written order or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating (1) the date, circumstances and source of the order and (2) that the Contractor regards the order as a change order.
- (c) Except as provided in this clause, no order, statement or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.
- (d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for an adjustment based on defective specifications, no proposal for any change under paragraph (b) above shall be allowed for any costs incurred more than 20 days (5 days for oral orders) before the Contractor gives written notice as required. In the case of defective specifications for which the PHA is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.
- (e) The Contractor must assert its right to an adjustment under this clause within 30 days after (1) receipt of a written change order under paragraph (a) of this clause, or (2) the furnishing of a written notice under paragraph (b) of this clause, by submitting a written statement describing the general nature and the amount of the proposal. If the facts justify it, the Contracting Officer may extend the period for submission. The proposal may be included in the notice required under paragraph (b) above. No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.
- (f) The Contractor's written proposal for equitable adjustment shall be submitted in the form of a lump sum proposal supported with an itemized breakdown of all increases and decreases in the contract in at least the following details:

- (1) Direct Costs. Materials (list individual items, the quantity and unit cost of each, and the aggregate cost); Transportation and delivery costs associated with materials; Labor breakdowns by hours or unit costs (identified with specific work to be performed); Construction equipment exclusively necessary for the change; Costs of preparation and/ or revision to shop drawings resulting from the change; Worker's Compensation and Public Liability Insurance; Employment taxes under FICA and FUTA; and, Bond Costs when size of change warrants revision.
- (2) Indirect Costs. Indirect costs may include overhead, general and administrative expenses, and fringe benefits not normally treated as direct costs.
- (3) Profit. The amount of profit shall be negotiated and may vary according to the nature, extent, and complexity of the work required by the change. The allowability of the direct and indirect costs shall be determined in accordance with the Contract Cost Principles and Procedures for Commercial Firms in Part 31 of the Federal Acquisition Regulation (48 CFR 1-31), as implemented by HUD Handbook 2210.18, in effect on the date of this contract. The Contractor shall not be allowed a profit on the profit received by any subcontractor. Equitable adjustments for deleted work shall include a credit for profit and may include a credit for indirect costs. On proposals covering both increases and decreases in the amount of the contract, the application of indirect costs and profit shall be on the net-change in direct costs for the Contractor or subcontractor performing the work.
- (g) The Contractor shall include in the proposal its request for time extension (if any), and shall include sufficient information and dates to demonstrate whether and to what extent the change will delay the completion of the contract in its entirety.
- (h) The Contracting Officer shall act on proposals within 30 days after their receipt, or notify the Contractor of the date when such action will be taken.
- (i) Failure to reach an agreement on any proposal shall be a dispute under the clause entitled Disputes herein. Nothing in this clause, however, shall excuse the Contractor from proceeding with the contract as changed.
- (j) Except in an emergency endangering life or property, no change shall be made by the Contractor without a prior order from the Contracting Officer.

30. Suspension of Work

- (a) The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the PHA.
- (b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified (or within a reasonable time if not specified) in this contract an adjustment shall be made for any increase in the cost of performance of the contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have

- been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or for which any equitable adjustment is provided for or excluded under any other provision of this contract.
- (c) A claim under this clause shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order); and, (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.

31. Disputes

- (a) "Claim," as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to the contract. A claim arising under the contract, unlike a claim relating to the contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim. The submission may be converted to a claim by complying with the requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.
- (b) Except for disputes arising under the clauses entitled Labor Standards - Davis Bacon and Related Acts, herein, all disputes arising under or relating to this contract, including any claims for damages for the alleged breach thereof which are not disposed of by agreement, shall be resolved under this clause.
- (c) All claims by the Contractor shall be made in writing and submitted to the Contracting Officer for a written decision. A claim by the PHA against the Contractor shall be subject to a written decision by the Contracting Officer.
- (d) The Contracting Officer shall, within 60 (unless otherwise indicated) days after receipt of the request, decide the claim or notify the Contractor of the date by which the decision will be made.
- (e) The Contracting Officer's decision shall be final unless the Contractor (1) appeals in writing to a higher level in the PHA in accordance with the PHA's policy and procedures, (2) refers the appeal to an independent mediator or arbitrator, or (3) files suit in a court of competent jurisdiction. Such appeal must be made within (30 unless otherwise indicated) days after receipt of the Contracting Officer's decision.
- (f) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under or relating to the contract, and comply with any decision of the Contracting Officer.

32. Default

- (a) If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with the diligence that will insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within this time, the Contracting Officer may, by written notice to the Contractor, terminate the right to

proceed with the work (or separable part of the work) that has been delayed. In this event, the PHA may take over the work and complete it, by contract or otherwise, and may take possession of and use any materials, equipment, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the PHA resulting from the **Convenience** Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the PHA in completing the work.

- (b) The Contractor's right to proceed shall not be terminated or the Contractor charged with damages under this clause if—
- (1) The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include (i) acts of God, or of the public enemy, (ii) acts of the PHA or other governmental entity in either its sovereign or contractual capacity, (iii) acts of another contractor in the performance of a contract with the PHA, (iv) fires, (v) floods, (vi) epidemics, (vii) quarantine restrictions, (viii) strikes, (ix) freight embargoes, (x) unusually severe weather, or (xi) delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and
 - (2) The Contractor, within days (10 days unless otherwise indicated) from the beginning of such delay (unless extended by the Contracting Officer) notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of the delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, time for completing the work shall be extended by written modification to the contract. The findings of the Contracting Officer shall be reduced to a written decision which shall be subject to the provisions of the Disputes clause of this contract.
- (c) If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been for convenience of the PHA.

33. Liquidated Damages

- (a) If the Contractor fails to complete the work within the time specified in the contract, or any extension, as specified in the clause entitled Default of this contract, the Contractor shall pay to the PHA as liquidated damages, the sum of \$ _____ [Contracting Officer insert amount] for each day of delay. If different completion dates are specified in the contract for separate parts or stages of the work, the amount of liquidated damages shall be assessed on those parts or stages which are delayed. To the extent that the Contractor's delay or nonperformance is excused under another clause in this contract, liquidated damages shall not be due the PHA. The Contractor remains liable for damages caused other than by delay.
- (b) If the PHA terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final

completion of the work together with any increased costs occasioned the PHA in completing the work.

- (c) If the PHA does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

34. Termination for

- (a) The Contracting Officer may terminate this contract in whole, or in part, whenever the Contracting Officer determines that such termination is in the best interest of the PHA. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which the performance of the work under the contract is terminated, and the date upon which such termination becomes effective.
- (b) If the performance of the work is terminated, either in whole or in part, the PHA shall be liable to the Contractor for reasonable and proper costs resulting from such termination upon the receipt by the PHA of a properly presented claim setting out in detail: (1) the total cost of the work performed to date of termination less the total amount of contract payments made to the Contractor; (2) the cost (including reasonable profit) of settling and paying claims under subcontracts and material orders for work performed and materials and supplies delivered to the site, payment for which has not been made by the PHA to the Contractor or by the Contractor to the subcontractor or supplier; (3) the cost of preserving and protecting the work already performed until the PHA or assignee takes possession thereof or assumes responsibility therefore; (4) the actual or estimated cost of legal and accounting services reasonably necessary to prepare and present the termination claim to the PHA; and (5) an amount constituting a reasonable profit on the value of the work performed by the Contractor.
- (c) The Contracting Officer will act on the Contractor's claim within days (60 days unless otherwise indicated) of receipt of the Contractor's claim.
- (d) Any disputes with regard to this clause are expressly made subject to the provisions of the Disputes clause of this contract.

35. Assignment of Contract

The Contractor shall not assign or transfer any interest in this contract; except that claims for monies due or to become due from the PHA under the contract may be assigned to a bank, trust company, or other financial institution. Such assignments of claims shall only be made with the written concurrence of the Contracting Officer. If the Contractor is a partnership, this contract shall inure to the benefit of the surviving or remaining member(s) of such partnership as approved by the Contracting Officer.

36. Insurance

- (a) Before commencing work, the Contractor and each subcontractor shall furnish the PHA with certificates of insurance showing the following insurance is in force and will insure all operations under the Contract:
 - (1) Workers' Compensation, in accordance with state or Territorial Workers' Compensation laws.
 - (2) Commercial General Liability with a combined single limit for bodily injury and property damage of not less than \$ _____ [Contracting Officer insert amount]

per occurrence to protect the Contractor and each subcontractor against claims for bodily injury or death and damage to the property of others. This shall cover the use of all equipment, hoists, and vehicles on the site(s) not covered by Automobile Liability under (3) below. If the Contractor has a "claims made" policy, then the following additional requirements apply: the policy must provide a "retroactive date" which must be on or before the execution date of the Contract; and the extended reporting period may not be less than five years following the completion date of the Contract.

(3) Automobile Liability on owned and non-owned motor vehicles used on the site(s) or in connection therewith for a combined single limit for bodily injury and property damage of not less than \$ _____

[Contracting Officer insert amount] per occurrence.

(b) Before commencing work, the Contractor shall furnish the PHA with a certificate of insurance evidencing that Builder's Risk (fire and extended coverage) Insurance on all work in place and/or materials stored at the building site(s), including foundations and building equipment, is in force. The Builder's Risk Insurance shall be for the benefit of the Contractor and the PHA as their interests may appear and each shall be named in the policy or policies as an insured. The Contractor in installing equipment supplied by the PHA shall carry insurance on such equipment from the time the Contractor takes possession thereof until the Contract work is accepted by the PHA. The Builder's Risk Insurance need not be carried on excavations, piers, footings, or foundations until such time as work on the superstructure is started. It need not be carried on landscape work. Policies shall furnish coverage at all times for the full cash value of all completed construction, as well as materials in place and/or stored at the site(s), whether or not partial payment has been made by the PHA. The Contractor may terminate this insurance on buildings as of the date taken over for occupancy by the PHA. The Contractor is not required to carry Builder's Risk Insurance for modernization work which does not involve structural alterations or additions and where the PHA's existing fire and extended coverage policy can be endorsed to include such work.

(c) All insurance shall be carried with companies which are financially responsible and admitted to do business in the State in which the project is located. If any such insurance is due to expire during the construction period, the Contractor (including subcontractors, as applicable) shall not permit the coverage to lapse and shall furnish evidence of coverage to the Contracting Officer. All certificates of insurance, as evidence of coverage, shall provide that no coverage may be canceled or non-renewed by the insurance company until at least 30 days prior written notice has been given to the Contracting Officer.

37. Subcontracts

(a) Definitions. As used in this contract -

(1) "Subcontract" means any contract, purchase order, or other purchase agreement, including modifications and change orders to the foregoing, entered into by a subcontractor to furnish supplies, materials, equipment, and services for the performance of the prime contract or a subcontract.

(2) "Subcontractor" means any supplier, vendor, or firm that furnishes supplies, materials, equipment, or services to or for the Contractor or another subcontractor.

(b) The Contractor shall not enter into any subcontract with any subcontractor who has been temporarily denied participation in a HUD program or who has been suspended or debarred from participating in contracting programs by any agency of the United States Government or of the state in which the work under this contract is to be performed.

(c) The Contractor shall be as fully responsible for the acts or omissions of its subcontractors, and of persons either directly or indirectly employed by them as for the acts or omissions of persons directly employed by the Contractor.

(d) The Contractor shall insert appropriate clauses in all subcontracts to bind subcontractors to the terms and conditions of this contract insofar as they are applicable to the work of subcontractors.

(e) Nothing contained in this contract shall create any contractual relationship between any subcontractor and the PHA or between the subcontractor and HUD.

38. Subcontracting with Small and Minority Firms, Women's Business Enterprise, and Labor Surplus Area Firms

The Contractor shall take the following steps to ensure that, whenever possible, subcontracts are awarded to small business firms, minority firms, women's business enterprises, and labor surplus area firms:

- (a) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
- (b) Ensuring that small and minority businesses and women's business enterprises are solicited whenever they are potential sources;
- (c) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses and women's business enterprises;
- (d) Establishing delivery schedules, where the requirements of the contract permit, which encourage participation by small and minority businesses and women's business enterprises; and
- (e) Using the services and assistance of the U.S. Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and State and local governmental small business agencies.

39. Equal Employment Opportunity

During the performance of this contract, the Contractor/Seller agrees as follows:

(a) The Contractor/Seller shall not discriminate against any employee or applicant for employment because of race color, religion, sex, sexual orientation, gender identity, disability, or national origin.

(b) The Contractor/Seller shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, disability, or national origin. Such action shall include, but not be limited to, (1) employment, (2) upgrading demotion, (4) transfer, (5) recruitment or recruitment advertising, (6) layoff or termination, (7) rates of pay or other forms of compensation, and (8) selection for training, including apprenticeship

(c) The Contractor/Seller agrees to post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer setting forth the provisions of this nondiscrimination clause.

(d) The Contractor/Seller shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor/Seller, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(e) The Contractor/Seller shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.

(f) The Contractor/Seller shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

(g) The Contractor/Seller shall furnish all information and reports required by Executive Order 11246, as amended, Section 503 of the Rehabilitation Act of 1973, as amended, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto. The Contractor/Seller shall permit

access to its books, records, and accounts by the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(h) In the event of a that the Contractor/Seller is in noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated or suspended in whole or in part and the contractor/seller may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(i) The contractor/seller will include the provisions of paragraphs (a) through (h) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each sub[contractor/seller] or vendor. The [contractor/seller] will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the [contractor/seller] becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the [contractor/seller] may request the United States to enter into such litigation to protect the interests of the United States.

(j) Compliance with the requirements of this clause shall be to the maximum extent consistent with, but not in derogation of, compliance with section 7(b) of the Indian Self-Determination and Education Assistance Act and the Indian Preference clause of this contract.

40. Employment, Training, and Contracting Opportunities for Low-Income Persons, Section 3 of the Housing and Urban Development Act of 1968.

(a) The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (section 3). The purpose of section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

(b) The parties to this contract agree to comply with HUD's regulations in 24 CFR Part 75, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the Part 75 regulations.

(c) The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this section 3 clause and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 prioritization requirements and shall state the minimum percentages of labor hour requirements established in the Benchmark Notice (FR-6085-N-04).

(d) The contractor agrees to include this section 3 clause in every subcontract subject to compliance with regulations in 24 CFR Part 75, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR Part 75. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR Part 75.

(e) Noncompliance with HUD's regulations in 24 CFR Part 75 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

(f) Contracts, subcontracts, grants, or subgrants subject to Section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 5307(b)) or subject to tribal preference requirements as authorized under 101(k) of the Native American Housing Assistance and Self-Determination Act (25 U.S.C. 4111(k)) must provide preferences in employment, training, and business opportunities to Indians and Indian organizations, and are therefore not subject to the requirements of 24 CFR Part 75.

41. Interest of Members of Congress

No member of or delegate to the Congress of the United States of America shall be admitted to any share or part of this contract or to any benefit that may arise therefrom.

42. Interest of Members, Officers, or Employees and Former Members, Officers, or Employees

No member, officer, or employee of the PHA, no member of the governing body of the locality in which the project is situated, no member of the governing body of the locality in which the PHA was activated, and no other public official of such locality or localities who exercises any functions or responsibilities with respect to the project, shall, during his or her tenure, or for one year thereafter, have any interest, direct or indirect, in this contract or the proceeds thereof.

43. Limitations on Payments made to Influence Certain Federal Financial Transactions

- (a) The Contractor agrees to comply with Section 1352 of Title 31, United States Code which prohibits the use of **Acts** Federal appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.
- (b) The Contractor further agrees to comply with the requirement of the Act to furnish a disclosure (OMB Standard Form LLL, Disclosure of Lobbying Activities) if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

44. Royalties and Patents

The Contractor shall pay all royalties and license fees. It shall defend all suits or claims for infringement of any patent rights and shall save the PHA harmless from loss on account thereof; except that the PHA shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified and the Contractor has no reason to believe that the specified design, process, or product is an infringement. If, however, the Contractor has reason to believe that any design, process or product specified is an infringement of a patent, the Contractor shall promptly notify the Contracting Officer. Failure to give such notice shall make the Contractor responsible for resultant loss.

45. Examination and Retention of Contractor's Records

- (a) The PHA, HUD, or Comptroller General of the United States, or any of their duly authorized representatives shall, until 3 years after final payment under this contract, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract for the purpose of making audit, examination, excerpts, and transcriptions.
- (b) The Contractor agrees to include in first-tier subcontracts under this contract a clause substantially the same as paragraph (a) above. "Subcontract," as used in this clause, excludes purchase orders not exceeding \$10,000.
- (c) The periods of access and examination in paragraphs (a) and (b) above for records relating to (1) appeals under the Disputes clause of this contract, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which the PHA, HUD, or Comptroller General or any of their duly authorized representatives has taken exception shall continue until disposition of such appeals, litigation, claims, or exceptions.

46. Labor Standards - Davis-Bacon and Related

If the total amount of this contract exceeds \$2,000, the Federal labor standards set forth in the clause below shall apply to the development or construction work to be performed under the contract.

- (a) Minimum Wages.
 - (1) All laborers and mechanics employed under this contract in the development or construction of the project(s) involved will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the regular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall

be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(2) (i) Any class of laborers or mechanics, including

helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met: (A) The work to be performed by the classification requested is not performed by a classification in the wage determination; and (B) The classification is utilized in the area by the construction industry; and (C) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

- (ii) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employee Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.
- (iii) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.
- (iv) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (a)(2)(ii) or (iii) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in classification.
- (3) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.
- (4) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the

amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

- (b) Withholding of funds. HUD or its designee shall, upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working in the construction or development of the project, all or part of the wages required by the contract, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due.
- (c) Payrolls and basic records.
- (1) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working in the construction or development of the project. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under 29 CFR 5.5(a)(1)(iv), that the wages of any laborer or mechanic include the amount of costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(2) (i) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under subparagraph (c)(1) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The Contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1214-0149.)

(ii) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

- (A) That the payroll for the payroll period contains the information required to be maintained under paragraph (c) (1) of this clause and that such information is correct and complete;
 - (B) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3; and
 - (C) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
- (iii) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirements for submission of the "Statement of Compliance" required by subparagraph (c)(2)(ii) of this clause.
- (iv) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

(3) The Contractor or subcontractor shall make the records required under subparagraph (c)(1) available for inspection, copying, or transcription by authorized representatives of HUD or its designee, the Contracting Officer, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to

make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

- (d) (1) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship and Training, Employer and Labor Services (OATELS), or with a State Apprenticeship Agency recognized by OATELS, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by OATELS or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator of the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event OATELS, or a State Apprenticeship Agency recognized by OATELS, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
- (2) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under

the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

- (3) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.
- (e) Compliance with Copeland Act requirements. The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.
- (f) Contract termination; debarment. A breach of this contract clause may be grounds for termination of the contract and for debarment as a Contractor and a subcontractor as provided in 29 CFR 5.12.
- (g) Compliance with Davis-Bacon and related Act requirements. All rulings and interpretations of the Davis-Bacon and related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.
- (h) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this clause shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the PHA, HUD, the U.S. Department of Labor, or the employees or their representatives.
- (i) Certification of eligibility.
 - (1) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

- (2) No part of this contract shall be subcontracted to any person or firm ineligible for award of a United States Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
- (3) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.
- (j) Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.
 - (1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics, including watchmen and guards, shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.
 - (2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the provisions set forth in subparagraph (j)(1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic (including watchmen and guards) employed in violation of the provisions set forth in subparagraph (j)(1) of this clause, in the sum of \$27 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by provisions set forth in subparagraph (j)(1) of this clause. DOL posts current fines at: <https://www.dol.gov/whd/govcontracts/cwhssa.htm#cmp>
 - (3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in subparagraph (j)(2) of this clause.
- (k) Subcontracts. The Contractor or subcontractor shall insert in any subcontracts all the provisions contained in this clause, and such other clauses as HUD or its designee may by appropriate instructions require, and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all these provisions.

47. Non-Federal Prevailing Wage Rates

(a) Any prevailing wage rate (including basic hourly rate and any fringe benefits), determined under State or tribal law to be prevailing, with respect to any employee in any trade or position employed under the contract, is inapplicable to the contract and shall not be enforced against the Contractor or any subcontractor, with respect to employees engaged under the contract whenever such non-Federal prevailing wage rate exceeds:

(1) The applicable wage rate determined by the Secretary of Labor pursuant to the Davis-Bacon Act (40 U.S.C. 3141 et seq.) to be prevailing in the locality with respect to such trade;

(b) An applicable apprentice wage rate based thereon specified in an apprenticeship program registered with the U.S. Department of Labor (DOL) or a DOL-recognized State Apprenticeship Agency; or

(c) An applicable trainee wage rate based thereon specified in a DOL-certified trainee program.

48. Procurement of Recovered Materials.

(a) In accordance with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, the Contractor shall procure items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition. The Contractor shall procure items designated in the EPA guidelines that contain the highest percentage of recovered materials practicable unless the Contractor determines that such items: (1) are not reasonably available in a reasonable period of time; (2) fail to meet reasonable performance standards, which shall be determined on the basis of the guidelines of the National Institute of Standards and Technology, if applicable to the item; or (3) are only available at an unreasonable price.

() Paragraph (a) of this clause shall apply to items purchased under this contract where: (1) the Contractor purchases in excess of \$10,000 of the item under this contract; or (2) during the preceding Federal fiscal year, the Contractor: (i) purchased any amount of the items for use under a contract that was funded with Federal appropriations and was with a Federal agency or a State agency or agency of a political subdivision of a State; and (ii) purchased a total of in excess of \$10,000 of the item both under and outside that contract.

SECTION 01 10 00

SUMMARY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Contract description.
- B. Work by Owner.
- C. Owner supplied products.
- D. Contractor's use of site and premises.
- E. Future work.
- F. Work sequence.
- G. Owner occupancy.
- H. Specification Conventions.

1.2 CONTRACT DESCRIPTION

- A. Perform Work of Contract under stipulated sum contract with Owner in accordance with Conditions of Contract.

1.3 WORK BY OWNER

- A. Items noted NIC (Not in Contract) will be furnished and installed by Owner beginning after date of Substantial Completion.

1.4 OWNER SUPPLIED PRODUCTS – Not Used

1.5 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Limit use of site and premises to allow:
 - 1. Owner occupancy.
 - 2. Work by Others and Work by Owner.
 - 3. Use of site and premises by the public.
- B. Time Restrictions for Performing Work Disruptive to Owner's Operations: Perform work disruptive of Owner's operations outside normal Owner's normal business hours. Coordinate requirements and scheduling of disruptive work with Owner.
- C. Utility Outages and Shutdown: Schedule required utility outages and shutdowns with the Owner to minimize impact on Owner's operations.

1.6 FUTURE WORK – Not Used

1.7 WORK SEQUENCE – Not Used

1.8 OWNER OCCUPANCY

- A. The Owner will occupy the adjacent site and premises during the entire period of construction for the conduct of normal operations. Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.
- B. Schedule the Work to accommodate Owner occupancy.

1.9 SPECIFICATION CONVENTIONS

- A. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.
- B. 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 may occasionally occur. As such, in case of a conflict or inconsistency in the Drawings or Specifications not brought to the Architects attention prior to Bidding and/or clarified by Addendum, the Contractor shall have deemed to include the higher quantity or quality of material, or more labor intensive or costly installation in the Bid.
- C. 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 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cash allowances.
- B. Contingency allowances.
- C. Testing and inspection allowances.
- D. Schedule of values.
- E. Applications for payment.
- F. Change procedures.
- G. Defect assessment.
- H. Unit prices.
- I. Alternates.

1.2 CASH ALLOWANCES

- A. Costs Included in Cash Allowances: Cost of product to Contractor or Subcontractor, less applicable trade discounts.
- B. Costs Not Included in Cash Allowances But Included in Contract Sum/Price: Product delivery to site and handling at site, including unloading, uncrating, and storage; protection of products from elements and from damage; and labor for installation and finishing.
- C. Architect/Engineer Responsibilities:
 - 1. Confirm quantities.
 - 2. Prepare Change Order.
- D. Contractor Responsibilities:
 - 1. Assist Owner in selection of products.
 - 2. On notification of selection by Owner, execute purchase agreement with designated supplier.
 - 3. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
 - 4. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
- E. Differences in costs will be adjusted by Change Order.
- F. Allowances Schedule:

1. Section 09 65 00 – Resilient Plank Flooring: Include the total cost of material based on the unit price of \$5.00 per square foot for purchase of rigid core vinyl flooring. Cost of accessory materials required for installation is to be included in Contract Sum. Cash Allowance applies only to cost of rigid core vinyl flooring material.
2. Section 09 68 16 – Sheet Carpeting: Include the total cost of material based on the unit price of \$18.00 per square yard for purchase of sheet carpeting. Cost of accessory materials required for installation is to be included in Contract Sum. Cash Allowance applies only to cost of sheet carpeting material.
3. Section 12 35 30 – Residential Casework: Include the total cost of material based on the unit price of \$150.00 per lineal foot of cabinet for purchase of cabinets. Cost of accessory materials required for installation is to be included in Contract Sum. Cash Allowance applies only to cost of cabinets.

1.3 CONTINGENCY ALLOWANCES

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

1.4 TESTING AND INSPECTION ALLOWANCES

- A. A Testing and Inspection Allowance has been established by the Owner.

1.5 SCHEDULE OF VALUES

- A. Submit printed schedule on AIA Form G703 - Continuation Sheet for G702. Contractor's standard form or electronic media printout following format of specified AIA form will be considered.
- B. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- C. Format: Utilize Table of Contents of this Project Manual. Identify each line item with number and title of major specification Section. Identify site mobilization, bonds and insurance, and General Requirements as separate line items.
- D. Include in each line item, amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by unit cost to achieve total for each item.
- E. Include in each line item, direct proportional amount of Contractor's overhead and profit.
- F. Revise schedule to list approved Change Orders, with each Application for Payment. List each cost change by item separately.

1.6 APPLICATIONS FOR PAYMENT

- A. Submit three copies of each application on AIA Form G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet for G702 or approved Contractor's electronic media driven form.
- B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- C. Submit updated construction schedule with each Application for Payment.
- D. Payment Period: Submit at intervals stipulated in the Agreement.

- E. Submit a fully executed Sworn Statement indicating all monies owed as of the date of application. Sworn statements shall reflect the amount invoiced to the Contractor less any retention being withheld.
- F. Submit partial conditional, partial unconditional, full condition, full unconditional waivers of lien as applicable for each subcontractor and supplier included on the sworn statement. Waivers shall reflect the payment amount released to the subcontractor / supplier. Payment will not be released without verification of waivers for the full balance of the previous payment.
- G. Submit weekly certified payroll records on form WH347 in compliance with 40 USC §276a; 29 CFR Parts 1, 3, 5, 6 and 7.
- H. Substantiating Data: When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question as requested by the Architect.

1.7 CHANGE PROCEDURES

- A. The Architect/Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions in writing to the Contractor.
- B. The Architect/Engineer may issue a Proposal Request or Bulletin including a detailed description of proposed change with supplementary or revised Drawings and specifications. Contractor will prepare and submit estimate of cost and any required change in Contract Time within 14 days.
- C. Contractor may, upon request of the Architect, propose changes by submitting a request for change to Architect/Engineer describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors.
- D. Stipulated Sum/Price Change Order: Based on Proposal Request (Bulletins) and Contractor's fixed price quotation or Contractor's request for Change Order as approved by Architect/Engineer.
- E. Unit Price Change Order: For contract unit prices and quantities, the Change Order will be executed on fixed unit price basis. For unit costs or quantities of units of work which are not pre-determined, execute Work under Construction Change Directive. Changes in Contract Sum/Price or Contract Time will be computed as specified for Time and Material Change Order.
- F. Construction Change Directive: Architect/Engineer may issue directive, on AIA Form G713 Construction Change Directive signed by Owner, instructing Contractor to proceed with 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 change.
- G. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in Conditions of the Contract. Architect/Engineer will determine change allowable in Contract Sum/Price and Contract Time as provided in Contract Documents.
- H. 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.

- I. Document each quotation for change in cost or time with sufficient data to allow evaluation of quotation.
- J. Change Order Forms: AIA G701 Change Order.
- K. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in Conditions of the Contract.
- L. Correlation Of Contractor Submittals:
 - 1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
 - 2. Promptly revise progress schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
 - 3. Promptly enter changes in Project Record Documents.

1.8 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 appropriate remedy or adjust payment.
- C. The defective Work may remain, but unit sum/price will be adjusted to new sum/price at discretion of Owner.
- D. Defective Work will be partially repaired to instructions of Architect/Engineer, and unit sum/price will be adjusted to new sum/price at discretion of Owner.
- E. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.
- F. Authority of Architect/Engineer to assess defects is final.
- G. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products not completely unloaded from transporting vehicle.
 - 4. Products placed beyond lines and levels of required Work.
 - 5. Products remaining on hand after completion of the Work.
 - 6. Loading, hauling, and disposing of rejected products.

1.9 UNIT PRICES – Not Used

1.10 ALTERNATES – Not Used

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Coordination and project conditions.
- B. Field engineering.
- C. Preconstruction meeting.
- D. Site mobilization meeting.
- E. Progress meetings.
- F. Periodic construction visits.
- G. Pre-installation meetings.
- H. Project Record Documents.
- I. Acceptance of Preceding Work.
- J. Cutting and patching.
- K. Special procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various sections of 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, operating equipment.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work 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 except as otherwise indicated, conceal pipes, ducts, and wiring within construction. 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. After 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 Land Surveyor registered in State of Michigan and acceptable to Architect/Engineer.
- B. Locate and protect survey control and reference points. Promptly notify Architect/Engineer of discrepancies discovered.
- C. Control datum for survey is that shown on Drawings.
- 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 copy of site drawing and certificate signed by Land Surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.
- G. Maintain complete and accurate log of control and survey work as Work progresses.
- H. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- I. Promptly report to Architect/Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.
- J. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect/Engineer.

1.4 PRECONSTRUCTION MEETING

- A. Architect/Engineer will schedule meeting after Notice of Award.
- B. Attendance Required: Owner, Architect/Engineer, 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 list of Subcontractors, list of products, schedule of values, and progress schedule.
 - 5. Designation of personnel representing parties in Contract, and Architect/Engineer.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 7. Scheduling.
 - 8. Scheduling activities of Testing agency.
- D. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect/Engineer, Owner, and those affected by decisions made.

1.5 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum bi-monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major subcontractors and suppliers, Owner, Architect/Engineer, as appropriate to agenda topics for each meeting.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems impeding 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.
- E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect/Engineer, Owner, and those affected by decisions made.

1.6 PERIODIC CONSTRUCTION VISITS

- A. The Architect and Owner will visit the project site at weekly intervals. The purpose of the visits will be to monitor the progress and quality of the work.
- B. The Contractor's Site Superintendent shall be available for meetings with the Architect and Owner.
- C. Agenda:
 - 1. Review of Work in progress.
 - 2. Field observations, problems, and decisions.
 - 3. Identification of problems which impede planned progress.
 - 4. Maintenance of progress schedule.
 - 5. Corrective measures to regain projected schedules.
 - 6. Planned progress during succeeding work period.
 - 7. Maintenance of quality and work standards.
 - 8. Other business relating to Work.

1.7 PRE-INSTALLATION MEETINGS

- A. When required in individual specification sections, convene pre-installation meetings at Project site prior to commencing work of specific section.

- B. Require attendance of parties directly affecting, or affected by, Work of 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 copies to Architect/Engineer, Owner, and those affected by decisions made.

1.8 PROJECT RECORD DOCUMENTS

- A. Contractor shall maintain and update Project Record Drawings (As-Built Drawings) on site during construction. Contractor and each Subcontractor shall be responsible to update the as built drawings on a weekly basis.
- B. Project Record Documents shall be available for review by the Architect.

PART 2 PRODUCTS - Not Used

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 affecting:
 - 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 including excavation and fill, 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 to 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. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.

3.3 SPECIAL PROCEDURES – Not used.

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- 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 SUBMITTAL PROCEDURES

- A. Electronic Submittals: Prepare and transmit submittals of Product Data, Shop Drawings, Design Data, Test Reports, Certificates, Manufacturers Instructions, and Erection Drawings to Architect in electronic (.pdf) format.
- B. Samples: Where specifications require the submittal of samples for verification or selection, submit physical samples and/or physical color charts to the Architect. Electronic reproductions of color charts will not be accepted. Include Contractor's transmittal form identifying Project, Contractor, subcontractor and supplier; product designated by name indicated in specifications.
- C. Transmit electronic submittals with Contractor's transmittal form:
 - 1. Sequentially number submittals. Include the specification section in the submittal numbering system. Mark revised submittals with original number and sequential alphabetic suffix.
 - 2. Identify Project, Contractor, subcontractor and supplier; product designated by name indicated in specifications.

- D. Include Contractor's certification (stamp), signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite Project. Coordinate submission of related items.
- F. For each submittal for review, allow 15 days excluding delivery time to and from Contractor. Submittals for long lead time items shall be expedited by the Contractor in order to allow for the Owner's completion schedule. Notify Architect/Engineer of long lead time items requiring expedited review.
- G. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.
- H. Architect will return files electronically following review. Contractor shall distribute copies of reviewed submittals to appropriate parties.
- I. Contractor shall produce and provide a paper copy of approved submittals to the Architect, and to governing authorities upon request.
- J. Where specified in specific Submittals Articles, Contractor shall provide a paper copy of approved submittals to the Owner at closeout.
- K. When revised for resubmission, identify changes made since previous submission.
- L. Submittals not requested will not be recognized or processed.

1.3 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedules within 7 days after Notice to Proceed. After review, resubmit required revised data within ten days.
- B. Submit revised Progress Schedules with each Application for Payment.
- C. Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other concerned parties.
- D. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.
- E. Utilize Contractor's standard computer generated schedule format.
- F. 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.
- G. Indicate estimated percentage of completion for each item of Work at each submission.
- H. Revisions To Schedules:
 - 1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
 - 2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.

3. Prepare narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect [including effect of changes on schedules of separate contractors].

1.4 PROPOSED PRODUCTS LIST

- A. Within 7 days after Notice to Proceed, submit 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.

1.5 PRODUCT DATA

- A. Product Data: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Mark submittal to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.6 SHOP DRAWINGS

- A. Shop Drawings: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. When required by individual specification sections, provide shop drawings signed and sealed by professional engineer responsible for designing components shown on shop drawings.
 1. Include signed and sealed calculations to support design.
 2. Submit drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
 3. Make revisions and provide additional information when required by authorities having jurisdiction.
- D. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.7 SAMPLES

- A. Samples: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Samples For Selection as Specified in Product Sections:

1. Submit to Architect/Engineer for aesthetic, color, or finish selection.
 2. Submit samples of finishes from full range of manufacturers' standard colors, including premium and/or custom colors where specified, textures, and patterns for Architect/Engineer selection.
- C. Submit samples to illustrate functional and aesthetic characteristics of Products, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- D. Include identification on each sample, with full Project information.
- E. Submit number of samples specified in individual specification sections; Architect/Engineer will retain samples.
- F. Samples will not be used for testing purposes unless specifically stated in specification section.
- G. Architect will issue a schedule indicating colors selected.

1.8 DESIGN DATA

- A. Submit for Architect/Engineer's knowledge as contract administrator or for Owner.
- B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.9 TEST REPORTS

- A. Submit for Architect/Engineer's knowledge as contract administrator or for Owner.
- B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.10 CERTIFICATES

- A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or 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.

1.11 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.

1.12 MANUFACTURER'S FIELD REPORTS

- A. Submit reports for Architect/Engineer's benefit as contract administrator or for Owner.
- B. Submit report [in duplicate] within 5 days of observation to Architect/Engineer for information.
- C. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.13 ERECTION DRAWINGS

- A. Submit drawings for Architect/Engineer's benefit as contract administrator or for Owner.
- B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.
- C. Data indicating inappropriate or unacceptable Work may be subject to action by Architect/Engineer or Owner.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality control and control of installation.
- B. Tolerances.
- C. References.
- D. Labeling.
- E. Mock-up requirements.
- F. Testing and inspection services.
- G. Manufacturers' field services.
- H. Examination.
- I. Preparation.

1.2 QUALITY CONTROL AND 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. When 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 field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.3 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. When manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of 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 specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. When specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- E. Neither contractual relationships, duties, nor responsibilities of parties in Contract nor those of Architect/Engineer shall be altered from Contract Documents by mention or inference otherwise in reference documents.

1.5 LABELING

- A. Attach label from agency approved by authority having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.
- B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label.
 - 1. Model number.
 - 2. Serial number.
 - 3. Performance characteristics.

1.6 MOCK-UP REQUIREMENTS

- A. Tests will be performed under provisions identified in this section and identified in respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be comparison standard for remaining Work.
- D. Where mock-up has been accepted by Architect/Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so by Architect/Engineer.

1.7 TESTING AND INSPECTION SERVICES

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

- B. The independent firm will perform tests, inspections and other services specified in individual specification sections and as required by Authority having jurisdiction.
 - 1. Laboratory: Authorized to operate in State of Michigan.
 - 2. Laboratory Staff: Maintain full time registered Engineer on staff to review services.
 - 3. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to National Bureau of Standards or accepted values of natural physical constants.
- C. Testing, inspections and source quality control may occur on or off project site. Perform off-site testing as required by Architect/Engineer or Owner.
- D. Reports will be submitted by independent firm to Architect/Engineer, Contractor, and authority having jurisdiction, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
 - 1. Submit final report indicating correction of Work previously reported as non-compliant.
- 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 services.
 - 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- F. Testing and/or employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- G. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by same independent firm on instructions by Architect/Engineer. Payment for re-testing or re-inspection will be charged to Contractor by deducting testing charges from Contract Sum/Price.
- H. Agency Responsibilities:
 - 1. Test samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Architect/Engineer and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Architect/Engineer and Contractor of observed irregularities or non-conformance of Work or products.
 - 6. Perform additional tests required by Architect/Engineer.
 - 7. Attend preconstruction meetings and progress meetings.
- I. Agency Reports: After each test, promptly submit two copies of report to Architect/Engineer, Contractor, and authority having jurisdiction. When requested by Architect/Engineer, provide interpretation of test results. Include the following:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Name of inspector.
 - 4. Date and time of sampling or inspection.
 - 5. Identification of product and specifications section.
 - 6. Location in Project.
 - 7. Type of inspection or test.
 - 8. Date of test.
 - 9. Results of tests.
 - 10. Conformance with Contract Documents.

- J. Limits On Testing Authority:
1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency or laboratory may not approve or accept any portion of the Work.
 3. Agency or laboratory may not assume duties of Contractor.
 4. Agency or laboratory has no authority to stop the Work.

1.8 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 as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect/Engineer 30 days in advance of required observations.
- 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 01 33 00 - Submittal Procedures, MANUFACTURERS' FIELD REPORTS article.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify 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 utility services are available, of correct characteristics, and in 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 new material or substance in contact or bond.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities:
 - 1. Temporary electricity.
 - 2. Temporary lighting for construction purposes.
 - 3. Temporary heating.
 - 4. Temporary cooling.
 - 5. Temporary ventilation.
 - 6. Telephone service.
 - 7. Email service
 - 8. Temporary water service.
 - 9. Temporary sanitary facilities.

- B. Construction Facilities:
 - 1. Field offices and sheds.
 - 2. Vehicular access.
 - 3. Parking.
 - 4. Progress cleaning and waste removal.
 - 5. Fire prevention facilities.

- C. Temporary Controls:
 - 1. Barriers.
 - 2. Enclosures and fencing.
 - 3. Water control.
 - 4. Dust control.
 - 5. Erosion and sediment control.

- D. Removal of utilities, facilities, and controls.

1.2 TEMPORARY ELECTRICITY

- A. Provide and pay for power service required from utility source as needed for construction operation.

- B. Owner will pay cost of energy used. Exercise measures to conserve energy.

- C. Provide power outlets, with branch wiring and distribution boxes located as required for construction operations. Provide flexible power cords as required for portable construction tools and equipment.

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

- E. Permanent convenience receptacles may be utilized during construction.

1.3 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain lighting for construction operations to achieve 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 for specified lighting levels.
- D. Maintain lighting and provide routine repairs.
- E. Permanent building lighting may be utilized during construction.

1.4 TEMPORARY HEATING

- A. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.
- B. Enclose building prior to activating temporary heat in accordance with Enclosures article in this section.
- C. Prior to operation of permanent equipment for temporary heating purposes, verify 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.
- D. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in product sections.

1.5 TEMPORARY COOLING

- A. Provide and pay for cooling devices and cooling as needed to maintain specified conditions for construction operations.
- B. Enclose building prior to activating temporary cooling in accordance with Enclosures article in this section.
- C. Prior to operation of permanent equipment for temporary cooling purposes, verify 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.
- D. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.6 TEMPORARY VENTILATION

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

1.7 TELEPHONE SERVICE

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

1.8 EMAIL SERVICE

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

1.9 TEMPORARY WATER SERVICE

- A. Provide and pay for suitable quality water service as needed to maintain specified conditions for construction operations. Connect to existing water source.
- B. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

1.10 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of project mobilization.

1.11 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 6 persons.
- C. Locate offices and sheds minimum distance of 30 feet from existing and new structures.
- D. Do not use permanent facilities for field offices or for storage.
- E. Construction: Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations with steps and landings at entrance doors.
 - 1. Construction: Structurally sound, secure, weather tight enclosures for office and storage spaces. Maintain during progress of Work; remove [when no longer needed] [at completion of Work].
 - 2. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy and storage requirements.
 - 3. Exterior Materials: Weather resistant, finished in color acceptable to Owner.
 - 4. Interior Materials in Offices: Sheet type materials for walls and ceilings, pre-finished or painted; resilient floors and bases.
 - 5. Lighting for Offices: 50 ft C at desk top height, exterior lighting at entrance doors.
 - 6. Interior Materials in Storage Sheds: As required to provide specified conditions for storage of products.
- F. Environmental Control:
 - 1. Heating, Cooling, and Ventilating for Offices: Automatic equipment to maintain comfort conditions 68 degrees F heating and 76 degrees F cooling.
 - 2. Storage Spaces: Heating and ventilation as needed to maintain products in accordance with Contract Documents; lighting for maintenance and inspection of products.
- G. Storage Areas And Sheds: Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products to requirements of Section 01 60 00 - Product Requirements.

- H. Preparation: Fill and grade sites for temporary structures sloped for drainage away from buildings.
- I. Installation:
 - 1. Install office spaces ready for occupancy 15 days after Notice to Proceed.
 - 2. Employee Residential Occupancy: Not allowed on Owner's property.
- J. Maintenance And Cleaning:
 - 1. Weekly janitorial services for offices; periodic cleaning and maintenance for office and storage areas.
 - 2. Maintain approach walks free of mud, water, and snow.
- K. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

1.12 VEHICULAR ACCESS

- A. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of width and load bearing capacity to accommodate unimpeded traffic for construction purposes.
- B. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.
- C. Extend and relocate vehicular access as Work progress requires, provide detours as necessary for unimpeded traffic flow.
- D. Location as approved by Owner.
- E. Provide unimpeded access for emergency vehicles. Maintain 20 feet wide driveways with turning space between and around combustible materials.
- F. Provide means of removing mud from vehicle wheels before entering streets.
- G. Where available, use existing on-site roads for construction traffic.

1.13 PARKING

- A. Provide] temporary gravel surface parking areas to accommodate construction personnel.
- B. Locate as approved by Owner.
- C. When site space is not adequate, provide additional off-site parking.
- D. Use of designated existing on-site streets and driveways used for construction traffic is permitted. Tracked vehicles not allowed on paved areas.
- E. Use of existing parking facilities used by construction personnel is not permitted.
- F. Do not allow heavy vehicles or construction equipment in parking areas.
- G. Permanent Pavements And Parking Facilities:
 - 1. Prior to Substantial Completion, bases for permanent roads and parking areas may be used for construction traffic.

2. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.
3. Use of new permanent parking areas is permitted.

H. Maintenance:

1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

I. Removal, Repair:

1. Remove temporary materials and construction when permanent paving is usable.
2. Remove underground work and compacted materials to depth of 2 feet; fill and grade site as specified.
3. Repair existing permanent facilities damaged by use, to original or better condition.

J. Mud From Site Vehicles: Provide means of removing mud from vehicle wheels before entering streets.

1.14 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in 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 spaces.
- 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.

1.15 FIRE PREVENTION FACILITIES

- A. Prohibit smoking with buildings under construction and demolition. Designate area on site where smoking is permitted. Provide approved ashtrays in designated smoking areas.
- B. Establish fire watch for cutting and welding and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.
- C. Portable Fire Extinguishers: NFPA 10; 10 pound capacity, 4A-60B: C UL rating.
 1. Provide one fire extinguisher at each stair on each floor of buildings under construction and demolition.
 2. Provide minimum one fire extinguisher in every construction trailer and storage shed.
 3. Provide minimum one fire extinguisher on roof during roofing operations using heat producing equipment.

1.16 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's 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.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.17 ENCLOSURES AND FENCING

- A. Construction: Contractor's option.
- B. Provide 6 feet high fence around construction site; equip with vehicular and pedestrian gates with locks.
- C. Exterior Enclosures:
 - 1. Provide temporary 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. Provide access doors with self-closing hardware and locks.

1.18 WATER CONTROL

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.19 DUST CONTROL

- A. Execute Work by methods to minimize raising dust from construction operations.
- B. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

1.20 EROSION AND SEDIMENT CONTROL

- A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- B. Minimize surface area of bare soil exposed at one time.
- C. Provide temporary measures including berms, dikes, and drains, and other devices to prevent water flow.
- D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

- E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

1.21 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- B. Remove underground installations to minimum depth of 2 feet. Grade site as indicated on Drawings.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing 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 01 5713 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 01 8900: 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 33 1100: Water Utility Distribution Piping
- I. Section 33 3000: Sanitary Utility Sewerage Piping
- J. 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.
- B. CONTRACTOR must provide evidence of Storm Water Operator license.

Part 2 Products

2.01 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.

2.02 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/m²) 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).

2.03 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. CBR Puncture Strength: 300 lb-f minimum; ASTM D6241
 4. Trapezoidal Tear: 70 lb-f (310 N) minimum; ASTM D4533
 5. Flow Rate: 80 gal/min/sf. (54 l/s/m²) Minimum; ASTM D4491
 6. Permittivity: 1.4 sec⁻¹ minimum; ASTM D4491
 7. Apparent Opening Size: 80 U.S. Std. Sieve maximum; ASTM D4751
 8. UV-Stability: 70% retained strength; ASTM D4355 after 500 hours.

2.04 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/ m²) approximate weight.
 3. 100% agricultural straw 0.5 lbs/sy (.27 kg/m²).
 4. Stitch spacing: 1.5 inches (40 mm) on centers.

- B. Pegs shall be 6-inch (150 mm) long, hardwood pegs.

2.05 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.

2.06 Inlet Filter Fabric

- A. Filter fabric shall be constructed of 100% continuous polyester needle-punched non-woven engineering fabric. 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. CBR Puncture Strength: 300 lb-f minimum; ASTM D6241
 - 4. Trapezoidal Tear: 70 lb-f (310 N) minimum; ASTM D4533
 - 5. Flow Rate: 80 gal/min/sf. (54 l/s/m²) Minimum; ASTM D4491
 - 6. Permittivity: 1.4 sec⁻¹ minimum; ASTM D4491
 - 7. Apparent Opening Size: 100 U.S. Std. Sieve (150 µm) maximum; ASTM D4751
 - 8. UV-Stability: 70% retained strength; ASTM D4355 after 500 hours.

2.07 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/m²) 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 Section 32 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. CONTRACTOR is responsible to obtain and/or serve as the Certified Operator.
2. Weekly inspections are to be conducted by CONTRACTOR as a minimum, and after every rainfall event. A copy of the inspection report shall be submitted to the agency having jurisdiction, as well as OWNER and ENGINEER.
3. 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.
4. 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.
5. 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.

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 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.
- E. Product substitution procedures.
- F. Equipment electrical characteristics and components.

1.2 PRODUCTS

- A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
- C. Furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure 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.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- 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 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.

1.5 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 one 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 Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

1.6 PRODUCT SUBSTITUTION PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for Substitutions during bidding period to requirements specified in this section.
- B. Post-Bid Substitutions will only be considered when a product becomes unavailable through no fault of Contractor.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. A request constitutes a representation that Bidder:
 - 1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
 - 2. Will provide same warranty for Substitution as for 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/or Architect/Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.
- E. 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 Contract Documents.

PART 2 PRODUCTS

2.1 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Include lugs for terminal box.
- B. Cord and Plug: Furnish 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 - Not Used

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Starting of systems.
- D. Demonstration and instructions.
- E. Testing, adjusting and balancing.
- F. Protecting installed construction.
- G. Project record documents.
- H. Operation and maintenance data.
- I. Manual for materials and finishes.
- J. Manual for equipment and systems.
- K. Spare parts and maintenance products.
- L. Product warranties and product bonds.
- M. Maintenance service.

1.2 CLOSEOUT PROCEDURES

- A. Submit certification that the work is Substantially Complete and approved for occupancy by the Authority Having Jurisdiction, and Contractor's list of items to be completed to the Architect.
- B. Architect will inspect the work and will prepare a Punch List of items to be corrected or completed for final acceptance of the work.
- C. Upon completion of all work and correction of items included on the Punch List prepared by the Architect, submit written certification that Contract Documents have been reviewed, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's final review. Architect will visit the site and will verify that all items have been properly completed and/or corrected.
- D. Contractor shall reimburse the Owner for all re-inspection costs incurred as a result of Contractor's failure to complete and/or correct all items identified by the Architect. Charges to the Contractor shall be made at such times and in such amounts as the Architect invoices the Owner

under the rate schedule in effect at the time of service. Such charges to the Contractor will be deducted from the Contractor's progress payment or final payment as applicable.

- E. Provide submittals to Architect/Engineer required by authorities having jurisdiction.
- F. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.3 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.
- D. Replace filters of operating equipment.
- E. Clean debris from roofs, and drainage systems.
- F. Clean site; sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.4 STARTING OF SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect/Engineer seven days prior to start-up of each item.
- C. Verify 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 equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable 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 01 33 00 - Submittal Procedures that equipment or system has been properly installed and is functioning correctly.

1.5 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of final inspection.
- B. Demonstrate Project equipment instructed by qualified manufacturer's representative who is knowledgeable about the Project.
- C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.
- F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- G. Required instruction time for each item of equipment and system is specified in individual sections.

1.6 TESTING, ADJUSTING AND BALANCING

- A. Employ and pay for services of independent firm to perform testing, adjusting, and balancing.
- B. Independent firm will perform services specified in Section 23 05 93.
- C. Reports will be submitted by independent firm to Architect/Engineer indicating observations and results of tests and indicating compliance or non-compliance with requirements of Contract Documents.

1.7 PROTECTING INSTALLED CONSTRUCTION

- 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. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

1.8 PROJECT RECORD DOCUMENTS

- A. Maintain on site 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. Reviewed Shop Drawings, Product Data, and Samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- 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, not less than weekly.
- 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 depths of foundations in relation to finish first floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 4. Field changes of dimension and detail.
 - 5. Details not on original Contract drawings.
- G. Submit documents to Architect/Engineer with claim for final Application for Payment.

1.9 OPERATION AND MAINTENANCE DATA

- A. Submit data bound in 8-1/2 x 11 inch (A4) 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, and subject matter of binder when multiple binders are required.
- C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- E. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on 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.

1.10 MANUAL FOR MATERIALS AND FINISHES

- A. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy will be reviewed and returned, with Architect/Engineer comments. Revise content of document sets as required prior to final submission.
- B. Submit two sets of revised final volumes in final form with claim for Final Application for Payment.
- C. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Include information for re-ordering custom manufactured products.
- D. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- E. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.
- F. Additional Requirements: As specified in individual product specification sections.
- G. Include listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.11 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy will be reviewed and returned, with Architect/Engineer comments. Revise content of document sets as required prior to final submission.
- B. Submit two sets of revised final volumes in final form with claim for Final Application for Payment.
- C. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

- D. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- E. Include color coded wiring diagrams as installed.
- F. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and special operating instructions.
- G. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- H. Include servicing and lubrication schedule, and list of lubricants required.
- I. Include manufacturer's printed operation and maintenance instructions.
- J. Include sequence of operation by controls manufacturer.
- K. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- L. Include control diagrams by controls manufacturer as installed.
- M. Include Contractor's coordination drawings, with color coded piping diagrams as installed.
- N. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- O. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- P. Include test and balancing reports as specified in Section 01 40 00 - Quality Requirements.
- Q. Additional Requirements: As specified in individual product specification sections.
- R. Include listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

1.12 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections.
- B. Deliver to and place in location as directed by Owner; obtain receipt prior to final payment.
- C. Submit receipt for spare parts and maintenance products to Architect with claim for Final Application for Payment.

1.13 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
- B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.
- C. Verify documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Include Table of Contents and assemble in three D side ring binder with durable plastic cover.
- F. Submit prior to final Application for Payment.
- G. Time Of Submittals:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, provide extended warranty for the full length of the warranty period beyond the Date of Substantial Completion.
 - 2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

1.14 MAINTENANCE SERVICE – Not Used

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

Section 01 8900 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 01 5713: 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 1315: Sidewalks and Driveways
- I. Section 32 9219: Seeding

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, latest edition.

1.04 Requirements of Regulatory Agencies

- A. CONTRACTOR shall comply with Section 01 5713, 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.

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 .

- C. 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.
- D. 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, CONTRACTOR 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.
 - 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.
 - 3. Measurements:

- a. Trees under 8 inches in diameter will require the same length of tunnel as 8-inch trees. Measurements of tree diameters shall be taken four (4) feet 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 B&B (min)
 - b. "Malus Centzam" Centzam Crabapple, 2-inch B&B (min)
 - c. "Crataegus Phaenaopyrum" Washington Hawthorn, 8-foot B&B (min)
 - d. "Pinus Nigra" Austrian Pine, 6-foot B&B (min)
 - e. "Picea Pungens" Colorado Spruce, 5-foot B&B (min)
 - f. "Quercus Rubra" Red Oak, 2 ½-inch B&B (min)
 - g. "Pyrus Calleryana" Redspire Pear, 2-inch 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 6-inches, 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 measured transversely, nor less than 6 feet 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 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 for sections with rolled or straight curb or less than 24 inches 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. 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. 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 10 feet of the pavement, whichever is the lesser.
- 2. Backfilling of trenches in the shoulder area shall be carried to within 5 inches of the existing surface as specified under Trench "A" or Trench "B." The remaining depth shall be backfilled with a minimum of 5 inches of compacted 22A or 23A aggregate with calcium chloride applied, at the rate of 6 pounds per 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 6 inches of compacted 22A or 23A aggregate, with calcium chloride applied at the rate of 6 pounds per Ton 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 3 inches 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 3 inches of compacted 22A or 23A aggregate, with calcium chloride applied at the rate of 6 pounds per 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 of the existing surface as specified under Trench "B." The remaining depth shall be backfilled with two 6-inch layers of compacted 22A or 23A aggregate, with calcium chloride applied at the rate of 6 pounds per 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 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 2 inches 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 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 01 5713, 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 (\pm 0.25 foot).

- C. When the excess excavation has not been requested by the 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 02 4100 Selective Demolition

Part 1 General

1.01 Section Includes

- A. This section includes the selective removal and subsequent disposal of utilities, pavement, portions of buildings, and other items indicated to be removed

1.02 Description of Work

- A. Unless directed otherwise in the Contract Documents, CONTRACTOR shall:
1. Remove and properly dispose of all structures, trash, rubbish, basement walls, floors, foundations, sidewalks, steps and driveways from the specified parcel.
 2. Remove fuel tanks, outdoor toilets and septic tanks, cisterns, meter pits, and plug or abandon wells.
 3. Remove materials from the demolition site in accordance with federal, state and local regulations.
 4. Remove and dispose of appliances and other items that may contain refrigerants in accordance with 40 CFR, Part 82. Appliances and other items that may contain refrigerants include, but are not limited to, refrigerators, freezers, dehumidifiers and portable or central air conditioners.
 5. Remove and legally dispose of mercury-containing materials including fluorescent, high-pressure sodium, mercury vapor, metal halide light bulbs, and thermostats containing a liquid filled capsule. PCB-containing materials include capacitors, ballasts, and transformers where the component is contained within a metal jacket and does not have a specific, legible label stating no PCBs are present.
 6. Disconnect utility services before demolition.
 7. Perform site clearance, grading and restoration.
 8. Complete the demolition work in accordance with the plans and these technical specifications and any special provisions included in the Contract Documents.

1.03 Protection of the Public and Properties

- A. Littering Streets:
1. CONTRACTOR shall be responsible for removing any demolition debris or mud from any street, alley or right-of-way resulting from the execution of the demolition work. Any cost incurred by OWNER in cleaning up any litter or mud shall be charged to CONTRACTOR and be deducted from funds due for the work.
 2. Littering of the site shall not be permitted.
 3. Waste materials shall be promptly removed from the site.
- B. Street Closure:

1. If it should become necessary to close any traffic lanes, it shall be CONTRACTOR's responsibility to acquire the necessary obstruction permits and to place adequate barricades and warning signs as required the agency having jurisdiction.
 2. Street or lane closures shall be coordinated with the appropriate agency having jurisdiction.
- C. Protection of the Public by CONTRACTOR:
1. Sidewalks: CONTRACTOR shall be responsible for any damage to public sidewalks abutting or adjacent to the demolition properties resulting from the execution of the demolition work.
 - a. Cost of repair or replacement shall be considered incidental to the work and CONTRACTOR shall obtain permits and pay fees.
 2. Pedestrian Access: It shall be CONTRACTOR's responsibility to place and construct the necessary warning signs, barricades, fencing and temporary pedestrian sidewalks, as directed by ENGINEER; and to maintain alternate pedestrian access for sidewalks around the demolition site.
 - a. Cost of these items shall be considered incidental to the work.
 3. Temporary Fence: Temporary fence shall be erected around areas of excavation, dangerous building(s) or structure(s) to prevent access to the public. Such fence shall be at least four feet high, consistently restrictive from top to grade, and without horizontal openings wider than two inches. Fence shall be erected before demolition and shall not be removed until the hazard is removed.
- D. Demolition Hours:
1. CONTRACTOR shall comply with any restrictions to working hours as included in the Contract Documents.
 2. CONTRACTOR shall comply with all applicable ordinances and restrictions of the agency having jurisdiction.
- E. Noise Pollution:
1. Construction equipment used in conjunction with this project shall be in good repair and adequately muffled. CONTRACTOR shall comply with noise pollution requirements of the agency having jurisdiction.
- F. Dust Control:
1. CONTRACTOR shall comply with applicable air pollution control requirements of the agency having jurisdiction.
 2. CONTRACTOR shall take appropriate actions to minimize atmospheric pollution.
 3. To minimize atmospheric pollution, ENGINEER shall have the authority to require that reasonable precautions be taken to prevent particulate matter from becoming airborne. Such reasonable precautions shall include, but not be limited to:

- a. The use of water or chemicals for control of dusts in the demolition of existing buildings or structures, construction operations, the grading of roads, or the clearing of land.
 - b. Covering, when in motion, open-bodied trucks transporting materials likely to give rise to airborne dusts.
- G. Requirements for the Reduction of Fire Hazards:
- 1. Removal of Material:
 - a. Before demolition of any part of any building, CONTRACTOR shall remove volatile or flammable materials, such as gasoline, kerosene, benzene, cleaning fluids, paints or thinners in containers, and similar substances.
 - 2. Fire Extinguishing Equipment:
 - a. CONTRACTOR shall be responsible for having and maintaining the correct type and class of fire extinguisher on site.
 - b. When a cutting torch or other equipment that might cause a fire is being used, a fire extinguisher shall be placed close at hand for instant use.
 - 3. Fires:
 - a. No fires of any kind will be permitted in the demolition work area.
 - 4. Hydrants:
 - a. No material obstructions or debris shall be placed or allowed to accumulate within fifteen feet of any fire hydrant.
 - b. Fire hydrants shall be accessible at all times.
 - 5. Debris:
 - a. Debris shall not be allowed to accumulate on roofs, floors, or in areas outside of and around any structure being demolished.
 - b. Excess debris and materials shall be removed from the site as the work progresses.
 - 6. Telephone Service:
 - a. CONTRACTOR shall arrange for access to and use of, during working hours, one or more telephones in the vicinity of the work site for the purposes of making calls in case of fire or other emergencies, and shall keep all personnel on the job, and the local emergency response agency informed of the location of such telephones.
 - b. CONTRACTOR's foreman, or at least one regular member of each shift, shall be charged with the responsibility of promptly calling emergency services when necessary. The same person shall be required to inspect the building and the site frequently for possible fires or fire-producing conditions and to apply appropriate corrective action, particularly at the close of work each day.

H. Protection of Public Utilities:

1. CONTRACTOR shall not damage existing fire hydrants, street lights, traffic signals, power poles, telephone poles, fire alarm boxes, wire cables, pole guys, underground utilities or other appurtenances in the vicinity of the demolition sites.
2. CONTRACTOR shall pay for temporary relocation of utilities, which are relocated at CONTRACTOR's request for his convenience.

I. Protection of Adjacent Property:

1. CONTRACTOR shall not damage or cause to be damaged any public right-of-way, structures, parking lots, drives, streets, sidewalks, utilities, lawns or any other property adjacent to parcels released for demolition whether or not the property is scheduled for future demolition.
2. CONTRACTOR shall provide such sheeting and shoring, fencing, or other temporary barricades, as required, to protect adjacent property during demolition. Care must also be taken to prevent the spread of dust and flying particles toward adjacent properties.
3. CONTRACTOR shall restore existing agricultural drain tiles or roadway subdrains that are cut or removed, including drainable backfill, to original condition
 - a. Repairs shall be subject to approval by the property owner where applicable, and by ENGINEER.

1.04 Risk of Loss

- A. CONTRACTOR shall accept the site in its present condition and shall inspect the site for its character and the type of structures to be demolished.
- B. OWNER assumes no responsibility for the condition of existing buildings, structures, and other property within the demolition area, or the condition of the property before or after the solicitation for proposals.
- C. No adjustment of proposal price or allowance for any change in conditions that occur after the acceptance of the lowest responsible, responsive proposal will be allowed.

1.05 Property Ownership

- A. Title:
 1. Property address, legal description, and ownership will be included in the Contract Documents.
 2. Upon execution of the contract for the work of demolition and site clearance on all or any part of the demolition area, all rights, title, and interest of OWNER in and to buildings, structures and other property to be demolished and/or removed by CONTRACTOR on part or all of said project area as described in the Contract Documents and contract addenda thereto, shall be deemed to be vested in CONTRACTOR.

- B. Land:
 - 1. No property rights, title, or interest of any kind whatsoever, in or to the land or premises upon which such buildings or structures stand, is created, assigned, conveyed, granted, or transferred to CONTRACTOR, or any other person or persons, except only the license and right of entry to remove such buildings and structures in strict accordance with the Contract Documents.
 - 2. CONTRACTOR shall not use the land or premises, or allow any other party to use the land or premises, for any purpose other than activities in direct support of the demolition of the building.

1.06 Vacating of Buildings

- A. Structure(s) identified in the Contract Documents shall be vacated before a Notice to Proceed is issued and CONTRACTOR begins work.
- B. In case CONTRACTOR finds that any structure is not vacated, CONTRACTOR shall immediately notify ENGINEER and shall not begin demolition or site clearance operations on such property until further directed by ENGINEER.
 - 1. CONTRACTOR's responsibility for such buildings will not begin until ENGINEER issues a Notice to Proceed with the demolition.
 - 2. No claim for extension of time or increase in price will be considered because of occupancy of any buildings.
 - 3. In case such occupancy is prolonged, OWNER reserves the right to delete the structure from the work.

1.07 Release of Buildings

- A. The demolition area shall be released to CONTRACTOR upon Award of Contract and Notice to Proceed. Said Notice to Proceed shall give any sequence of the demolition and the portion of work that is available to be released if all areas are not ready at the same time. ENGINEER shall approve any change in the sequence. CONTRACTOR shall have full control of the demolition progress and clearance of the site, subject to the provisions of the Contract Documents.

1.08 Permits and Fees

- A. CONTRACTOR shall obtain all the necessary permits and pay all permit fees that are required as a direct result of the demolition work specified herein.

1.09 Submittals

- A. The submittals shall be in accordance with Section 01 3300, Submittal Procedures, as well the requirements listed herein.
- B. Submittals shall include, but not be limited to, the following:
 - 1. Demolition Schedule:
 - a. Indicate overall schedule and interruptions required for utility and building services.

- b. Indicate demolition and removal sequence.
- c. Indicate location of items designated for reuse and OWNER's retention.
- d. Indicate location and construction of temporary work.

1.10 Quality Assurance

- A. Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.
- B. Conform to applicable code for procedures when hazardous or contaminated materials are discovered.
- C. Obtain required permits from authorities having jurisdiction.

Part 2 Products (Not Used)

Part 3 Execution

3.01 General

- A. CONTRACTOR shall be responsible for providing ENGINEER with a minimum of 24 hours advance notification prior to beginning the execution of demolition of any structure.

3.02 Salvage of Demolition Materials

- A. CONTRACTOR shall be allowed to salvage demolition materials only from property owned by OWNER. Property ownership will be shown in the Contract Documents.
- B. No salvage will be permitted on privately owned property. Privately owned property included for demolition under this contract will be strictly to abate a public nuisance as authorized by the property owner or as directed by the Courts.
 - 1. OWNER has the authority to abate the nuisance, however, OWNER does not have the right to salvage any materials.
 - 2. CONTRACTOR may recycle demolition debris at a licensed or permitted recycling center, however, all other debris must be disposed of at a licensed or permitted disposal facility.
- C. CONTRACTOR may salvage demolition materials on properties owned by OWNER as long as demolition is completed within the completion provisions included in the Contract Documents. Buildings, building materials, and equipment resulting from this work shall become the property of CONTRACTOR, and shall be removed from the premises at once. Salvaged material shall be removed immediately from the premises, right-of-way, streets or alleys.
- D. OWNER reserves the right to remove salvage items for use by OWNER. These items shall be identified in the Contract Documents or shall be removed by OWNER prior to the issuance of the Notice to Proceed.

3.03 Examination

- A. Examine existing equipment and structures indicated to be demolished before demolition.
- B. Determine where removals may result in structural deficiency or unplanned building collapse during demolition. Coordinate demolition sequence and procedures to prevent structures from becoming unstable.
- C. Determine where demolition may affect structural integrity or weather resistance of adjacent buildings or structures indicated to remain.
 - 1. Identify measures required to protect adjacent buildings and structures from damage.
 - 2. Identify remedial work including patching, repairing, bracing, and other work required to leave buildings and structures indicated to remain in structurally sound and weathertight and watertight condition.
- D. Verify hazardous material abatement is complete before beginning demolition, where applicable.

3.04 Demolition and Removals

- A. Structural Parts of Buildings:
 - 1. No wall or part thereof shall be permitted to fall outwardly from any building except through chutes or by other controlled means or methods, which will ensure safety and minimize dust, noise and other nuisance.
 - 2. Subject to site restrictions, outside chimneys or outside portions of chimneys shall be raised in advance of general demolition of each building. Any portion of a chimney inside a building shall be razed as soon as it becomes unsupported by reason of removal of other parts of the building.
 - 3. Any part of a building, whether structural, collateral, or accessory, which has become unstable through removal of other parts, shall be removed as soon as practicable, and no such unstable part shall be left free-standing or inadequately braced against all reasonably possible causes of collapse at the end of any day's work.
- B. Basements and Foundation Walls:
 - 1. Basement floors, footings, and foundations shall be completely removed from the site unless specifically stated in the special provisions. The basement area is to be inspected and approved by ENGINEER before backfilling is started.
 - 2. CONTRACTOR shall ensure that no basement excavation will remain open and exposed for more than 24 hours.
 - 3. CONTRACTOR shall contact ENGINEER when removal is complete to schedule this basement inspection. Failure to do so may result in re-excavation of the basement area at CONTRACTOR's expense.
- C. Concrete Slabs:

1. CONTRACTOR shall remove all concrete slabs, asphalt, surface obstructions, masonry slabs and appurtenances.

D. Retaining Walls:

1. Retaining walls or curbs near the perimeter of parcels shall be removed unless otherwise indicated in the Contract Documents.
2. CONTRACTOR shall employ hand labor or other suitable tools and equipment necessary to complete the work without damage to adjacent public or private property.
3. Where such retaining walls or curbs are removed, the embankment shall be graded to a slope of not greater than 3:1 horizontal: vertical or as directed by ENGINEER.
4. Cost of tree or brush removal due to the removal and grading out of the retaining wall shall be considered incidental and shall be included in pay item for demolition.

E. Fences:

1. Fences, guardrails, bumpers, signs, clotheslines, and similar facilities shall be completely removed from the site, except fences on the apparent boundary between a contract parcel and an improved non-contract parcel shall not be removed unless specifically stated in the special provisions.
2. Posts for support shall be pulled out or dug up so as to be entirely removed.

F. Partially Buried Objects:

1. Piping, posts, reinforcing bars, anchor bolts, railings and other partly buried objects protruding from the ground shall be removed. Remaining void shall be filled with soil and compacted in accordance with these specifications.

G. Vegetation:

1. CONTRACTOR shall remove all dead trees, trees identified for removal, stumps, trees which are not an asset to the property, bushes, vegetation, brush and weeds, whether standing or fallen, unless specifically stated otherwise by ENGINEER.
2. CONTRACTOR shall protect trees not removed from damage by the demolition operation. In the event that CONTRACTOR damages a tree, it shall be repaired or removed by CONTRACTOR as directed by ENGINEER.

H. Fuel Tanks:

1. Fuel tanks, above or below ground, shall be carefully removed and disposed of in a safe manner in accordance with local, state and federal regulations.
 - a. Fuel tanks, above or below the ground, or tanks which have been used for storage of gasoline, kerosene, benzene, oils or similar volatile materials shall be carefully removed and disposed of in a safe manner.

The time, place and manner of disposal will be as set forth in the Contract Documents.

- b. Other tanks or receptacles shall be pumped out or emptied in a safe manner, and then shall be flushed out immediately with water, carbon dioxide or nitrogen gas until they are gas-free when checked with a "Explosimeter" or another equally efficient instrument, before the work of removal is begun. Checking with the "Explosimeter" shall be done in the presence of ENGINEER by competent personnel.

I. Outdoor Toilets and Septic Tanks:

- 1. Outdoor toilets and septic tanks shall be pumped out by a licensed company.
- 2. Toilet building or septic tank shall be demolished and removed from the site.
 - a. Excavation or pit shall be backfilled and compacted in accordance with these specifications.
 - b. Septic tanks shall be broken up and removed from the site and the excavation filled in accordance with local, state, and federal regulations.

J. Cisterns and Meter Pits:

- 1. Cisterns and meter pits shall be demolished and removed. Excavations shall be backfilled and compacted in accordance with these specifications.

3.05 Well Plugging and Abandonment

- A. Wells shall be plugged and abandoned in accordance with local, state and federal regulations.

3.06 Disposal of Demolition Debris and Solid Waste

A. Debris:

- 1. Materials, rubbish, and trash shall be removed from the demolition area leaving the basements and demolition area free of debris.
- 2. Cost incurred by the OWNER in cleaning up such materials and debris left behind shall be deducted from funds due CONTRACTOR under this contract.

B. Tires:

- 1. CONTRACTOR shall visit the site to determine the number of tires that have been abandoned on site.
- 2. If any additional tires are found on site prior to commencing demolition activity, CONTRACTOR shall immediately notify ENGINEER of the quantity of additional tires found on site so a change order can be prepared for additional removal.

C. Disposal of Demolition Debris and Solid Waste:

1. Debris and solid waste shall be delivered by CONTRACTOR to designated disposal facilities, or to an approved disposal facility licensed in accordance with state and/or local regulations, laws, and zoning.
 2. CONTRACTOR shall be responsible to pay all fees for waste disposal.
 3. CONTRACTOR shall submit to ENGINEER copies of all disposal tickets for each structure demolished, where available, which identify the specific address of the origin of the debris associated with each ticket.
 4. Cost of disposal fees shall be considered incidental to the demolition.
- D. Asbestos Abatement:
1. Handling of asbestos material is subject to all applicable state and federal mandates.
 2. Asbestos removal is not required on privately owned property that may be included in this work as part of a public nuisance abatement court order; however, CONTRACTOR shall comply with applicable regulations regarding its handling and disposal.
 3. Asbestos will be removed by a licensed abatement contractor by a separate contract or in accordance with special provisions on properties owned by OWNER.
 4. In the event that asbestos is discovered on a property owned by the OWNER during demolition, CONTRACTOR shall notify ENGINEER and the asbestos shall be removed by a licensed abatement contractor by contract or in accordance with the special provisions.
- E. Demolition of Structures with Transite Siding:
1. Privately owned properties containing transite siding shall be listed in the Contract Documents, and all demolition debris from these structures shall be disposed of at an approved landfill.
 2. CONTRACTOR shall be responsible for notifying said landfill prior to commencing demolition on these structures to allow for authorization to dispose of material at the landfill.
 3. CONTRACTOR shall assume responsibility for the landfill fees for disposing of the demolition debris.
 4. Structures with transite siding shall be thoroughly sprayed with water during the execution of the demolition to contain airborne particles.
 5. Debris shall be thoroughly wetted prior to transporting to the landfill.
- F. Freon Removal and Disposal:
1. Handling of Freon containing appliances is subject to applicable state and federal mandates and regulations.
 2. CONTRACTOR shall be responsible for the identification and removal and disposal of the material in accordance with applicable regulations.

3. Costs associated with said removal and disposal shall be considered incidental and shall be included in the lump sum bid for demolition.
- G. PCB and Mercury Removal and Disposal:
1. Handling of any fluorescent lighting fixtures and ballasts containing PCB or mercury is subject to applicable state and federal mandates and regulations.
 2. CONTRACTOR shall be responsible for the removal and disposal of the material in accordance with applicable regulations.
 3. Costs associated with said removal and disposal shall be considered incidental and shall be included in the lump sum bid for demolition.

3.07 Sanitary Sewer and Water Service Disconnections

- A. Sanitary Sewer Service Disconnection: Sanitary sewer services shall be disconnected and plugged in conformance with the requirements of the local jurisdiction.
- B. Water Service Disconnection: Water services and stubs for the buildings or properties within the demolition work shall be disconnected in conformance with the requirements of the local jurisdiction.

3.08 Backfill, Grading, and Clean Up

- A. Backfill:
1. When site conditions permit, as determined by ENGINEER, on-site soil shall be used as backfill material. The top 9 to 12 inches of topsoil shall be stripped and stockpiled on site for use as final topsoil and grading material. If adequate topsoil is not available on site, CONTRACTOR shall bring in enough topsoil from off-site to place a minimum 8-inch cover on the entire site. Excess excavation materials shall be removed from the site.
 2. Topsoil material shall not be permitted as deep fill material. Any borrow or fill material shall be approved by ENGINEER before and during the placing of the material.
 3. Depressions on the property shall be filled, compacted, and graded to a uniform slope with adequate drainage.
- B. Compaction:
1. Excavations shall be backfilled with acceptable material and compacted in accordance with Article 3.06 of Section 31 2316, Structural Excavation and Backfilling.
 2. CONTRACTOR shall notify ENGINEER 24 hours in advance of placing any backfill or original backfill material so a soil sample can be obtained.
 3. It shall be the responsibility of CONTRACTOR to run a density test during and after the placement of the backfill material.
- C. Additional Fill Material:

1. Additional fill material shall be of equal quality to the soil adjacent to the excavation, and free of rubble or organic matter.
 2. CONTRACTOR shall provide for a minimum depth of 8 inches of topsoil over the excavated area.
 3. There shall be no payment for additional fill material, which shall be considered incidental to the demolition bid price. Additional fill material shall be acceptable fill material that meets the requirements of Section 2010.
- D. Hand Labor:
1. CONTRACTOR shall employ hand labor where the use of power machinery is unsafe or unable to produce a finished job. Hand labor shall also be used to clean the site of any debris.
- E. Grading:
1. The site shall be graded to conform to all surrounding areas and shall be finished to have a uniform surface that shall not permit ponding of water.
 2. CONTRACTOR shall grade and shape the site to drain, complete fine grading and final clean up as part of the lump sum price for demolition.
- F. Final Cleaning Up:
1. Before acceptance of the demolition work, CONTRACTOR shall remove all unused material and rubbish from the site of the work, remedy any objectionable conditions CONTRACTOR may have created on private property, and leave the right-of-way in a neat and presentable condition.
 2. CONTRACTOR shall not make agreements that allow salvaged or unused material to remain on private property.
 3. Ground occupied by CONTRACTOR in connection with the work shall be restored. Restoration shall include appropriate smoothing to its original condition and seeding of the area.
 4. On demolition sites where seeding will be delayed because of the allowable seeding dates, CONTRACTOR shall complete fine grading and shaping of the site to leave the site in a neat and presentable condition subject to the approval of ENGINEER.
 5. Final cleaning up shall be subject to approval of ENGINEER and in accordance with applicable regulations.

3.09 Safety and Fencing

- A. Safety:
1. CONTRACTOR shall comply with all applicable current federal, state and local safety and health regulations.
- B. Safety Fencing:

1. CONTRACTOR shall furnish and place a safety fence around the site of the work adequate to secure the demolition site, including any resulting debris or excavation, and to prevent pedestrian access. Fencing shall be considered incidental to the demolition.
2. Safety fence shall remain in place until the demolished materials are removed from the site and all holes or excavated areas are backfilled. The fencing material shall remain the property of CONTRACTOR.

3.10 Authorized Workers

- A. Only CONTRACTOR and its employees are allowed to demolish, dismantle, detach or dispose of any part of the demolition structure or its contents.

3.11 Daily Clean Up of Right-Of-Way And Private Property

- A. At the end of each workday, CONTRACTOR shall clean sidewalks, streets, and private property of any debris caused by the demolition operation.

End of Section

SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Formwork for cast-in place concrete.
 - 2. Shoring, bracing, and anchorage.
 - 3. Form stripping.

- B. Related Sections:
 - 1. Section 03 20 00 - Concrete Reinforcing.
 - 2. Section 03 11 19 – Insulating Concrete Forming: permanent forms for walls.
 - 3. Section 03 30 00 - Cast-In-Place Concrete.
 - 4. Section 32 13 13 - Concrete Paving.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
 - 2. ACI 318 - Building Code Requirements for Structural Concrete.
 - 3. ACI 347 - Guide to Formwork for Concrete.

- B. American Forest and Paper Association:
 - 1. AF&PA - National Design Specifications for Wood Construction.

1.3 DESIGN REQUIREMENTS

- A. Design, engineer and construct formwork, shoring and bracing in accordance with ACI 318 to conform to design and applicable code requirements to achieve concrete shape, line and dimension as indicated on Drawings.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

- B. Product Data: Submit data on pre-fabricated form materials.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 347.

- B. For wood products furnished for work of this Section, comply with AF&PA.

1.6 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

- B. Coordinate this Section with other sections of work, requiring attachment of components to formwork.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

- A. Form Materials: At discretion of Contractor.

2.2 FORMWORK ACCESSORIES

- A. Form Release Agent: Colorless mineral oil that will not stain concrete, or absorb moisture.
 - 1. Manufacturers:
 - a. Arcal Chemical Corporation Arcal-80.
 - b. Industrial Synthetics Company Synthex.
 - c. Nox-Crete Company Nox-Crete Form Coating.
 - d. Substitutions: Or equal.
- B. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.
- C. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

3.2 INSTALLATION

- A. Earth Forms:
 - 1. Earth forms are not permitted.
- B. Formwork - General:
 - 1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
 - 2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
 - 3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.
 - 4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
 - 5. Complete wedging and bracing before placing concrete.
- C. Forms for Smooth Finish Concrete:
 - 1. Use steel, plywood or lined board forms.

2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
 3. Install form lining with close-fitting square joints between separate sheets without springing into place.
 4. Use full size sheets of form lines and plywood wherever possible.
 5. Tape joints to prevent protrusions in concrete.
 6. Use care in forming and stripping wood forms to protect corners and edges.
 7. Level and continue horizontal joints.
 8. Keep wood forms wet until stripped.
- D. Framing, Studding and Bracing:
1. Space studs at 16 inches on center maximum for boards and 12 inches on center maximum for plywood.
 2. Size framing, bracing, centering, and supporting members with sufficient strength to maintain shape and position under imposed loads from construction operations.
 3. Construct beam soffits of material minimum of 2 inches thick.
 4. Distribute bracing loads over base area on which bracing is erected.
 5. When placed on ground, protect against undermining, settlement or accidental impact.
- E. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 318.
- F. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- G. Do not reuse wood formwork for concrete surfaces to be exposed to view after surface defects begin to appear. Do not patch formwork.

3.3 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces are indicated to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.
- D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer's specifications. Apply form coatings before placing reinforcing steel.

3.4 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Install formed openings for items to be embedded in or passing through concrete work.
- B. Locate and set in place items required to 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. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.
- E. Embedded Items:
 - 1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, water stops, and other features.
 - 2. Do not embed wood or uncoated aluminum in concrete.
 - 3. Obtain installation and setting information for embedded items furnished under other Specification sections.
 - 4. Securely anchor embedded items in correct location and alignment prior to placing concrete.
 - 5. Verify conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318 for size and location limitations.
- F. Screeds:
 - 1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
 - 2. Slope slabs to drain where required or as shown on Drawings.
 - 3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.

3.5 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.

3.6 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal has been approved by Architect/Engineer.
- 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.
- D. Leave forms in place for minimum number of days as specified in ACI 347.

3.7 ERECTION TOLERANCES

- A. Tolerances: Construct formwork to produce completed concrete surfaces within construction tolerances specified in ACI 117.

END OF SECTION

SECTION 03 11 19

INSULATING CONCRETE FORMING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes supply and installation of permanent insulating concrete forms as formwork, placement of steel reinforcement and placement of concrete into formwork. Adequate bracing and false work shall be installed by the Contractor in accordance with applicable codes.
- B. Related Sections:
 - 1. Section 03 20 00 – Concrete Reinforcing; reinforcing rods.
 - 2. Section 03 30 00 – Cast-In-Place Concrete; integrally reinforced concrete.
 - 3. Section 06 10 00 – Rough Carpentry; wood buck materials.
 - 4. Section 09 24 00 – Portland Cement Plastering; installation of parging over exposed ICF.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 305 - Hot Weather Concreting.
 - 3. ACI 306 - Cold Weather Concreting.
 - 4. ACI 309 - Guide for Consolidation of Concrete.
 - 5. ACI 318 - Building Code Requirements for Structural Concrete.
 - 6. ACI 347 - Guide to formwork for Concrete.
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 259 - Standard Test Method for Potential Heat of Building Materials.
 - 2. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.
 - 3. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM C165 - Standard Test Method for Measuring Compressive Properties of Thermal Insulations.
 - 2. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 - 3. ASTM C203 - Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation.
 - 4. ASTM C272 - Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
 - 5. ASTM C303 - Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation.
 - 6. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 7. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - 8. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and of Burning of Plastics in a Horizontal Position.

9. ASTM D1621 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.
10. ASTM D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.
11. ASTM D1761 - Standard Test Methods for Mechanical Fasteners in Wood (Modified for Polypropylene Web assessment).
12. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics
13. ASTM D2126 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
14. ASTM D2863 - Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index).
15. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
16. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
17. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
18. ASTM E 336 - Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings.
19. ASTM E1677 - Standard Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls.

D. Uniform Building Code (UBC):

1. UBC 26-3: Room Fire Test Standard for Interior Foam Plastic Systems.
2. UBC 26-4: Method of Test for the Evaluation of Flammability Characteristics of Exterior, Non-load-bearing Wall Panel Assemblies Using Foam Plastic Insulation, or
3. UBC 26-9: Method of Test for the Evaluation of Flammability Characteristics of Exterior, Non-load-bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multi-Story Test Apparatus

E. Underwriter Laboratories (UL):

1. UL 263 - Fire Tests of Building Construction and Materials.

1.3 DEFINITIONS

- A. *EPS*- Acronym for “Expanded Polystyrene” when referencing the insulating foam component of the Insulating Concrete Form System.
- B. *Form Alignment System*- a form alignment & scaffold system designed exclusively for use with Insulating Concrete Forms.
- C. *ICF*- Acronym for “Insulating (or Insulated) Concrete Form”

- D. *Window or Door Opening Buck*- a pre-manufactured or site constructed frame assembly consisting of wood material used to frame a rough opening within the forming system that will retain concrete around the opening. The frame can also provide for subsequent anchorage of doors and windows within the wall assembly.

1.4 SYSTEM DESCRIPTION

- A. Provide insulating concrete form product which has been manufactured and installed to withstand concrete placement loads without defects, damage, or failure and such that the cast-in-place concrete wall is designed according to ACI 318 "Building Code Requirements for Reinforced Concrete."
- B. General:
 - 1. Insulating concrete form system shall consist of two (2) flame resistant panels of expanded polystyrene (*EPS*) connected by either high-density polypropylene hinged pin foldable webs or EPS embedded polystyrene fastening strips interconnected with slide in format - high density polypropylene web connectors. EPS foam panels shall feature continuous vertical dove tail grooves on interior panel surfaces to provide integral surface bonding to concrete core once filled and concrete is cured. Dove tail grooves shall also facilitate structural linkage with end cap forms placed into the form cavity where required as part of the overall architectural design layout.
 - 2. All web fastening strips to run full height of form and be fitted top and bottom with reversible fitting, "triple-tooth" interlocking mechanisms to enable positive vertical interlocking of forms with each other. Wall system webs to provide minimum 1 ½" wide fastening strips at 8-inches (203mm) on center approximately 5/8-inch below insulation face to facilitate finish fastening of both interior and exterior finishes.
 - 3. Insulating concrete form system shall be capable of forming ALL of following concrete core thicknesses: 4, 6, 8, 10 or 12-inches wall sections (as required for various locations throughout project scope with standard form line-up) (See form dimensions summary Attachments Table A at end of Section.
 - 4. Insulating concrete form system shall provide a minimum insulation panel thickness of 2 5/8-inches throughout ALL forms and panels forming the form system product inventory (with exception of variance required for brick ledge and tapered top forms).
 - 5. All form units of wall forming system shall be capable of being shipped to site in folded condition to minimize shipping cost and site storage space requirement and be capable of being deployed to installation ready condition by simply unfolding the unit in a single pull motion or pull motion combined with insertion of a single web (at corner condition).
 - 6. Standards, corner forms and stand-alone panels of form system shall provide fully reversible interlocks along top and bottom edges to assure minimum product waste on site. EPS foam panels shall be molded with 1-inch (25mm) wide by ½-inch (12.7mm) high/deep alternating male/female reversible projection/socket interlocks positioned in pairs along both top and bottom edges of all panels.
 - 7. Wall system shall be capable of providing horizontal and vertical lock positioning of steel within form cavity to conform to all reinforcing requirements of ACI 318.
- C. Regulatory Requirements:
 - 1. Form system manufacturer shall provide on request, written documentation verifying active compliance to ICC-ES Acceptance Criteria AC-353 "Stay-in-place, Foam Plastic Insulating Concrete Form (ICF) Systems for Solid Concrete", with valid listing in the report verifying qualification of form system for use in Types I through V construction as qualified under the governing Building Code for this project and additional compliances as outlined in Section 1.4.C.3. (below).

2. As alternate to above, Form system manufacturer shall provide IAS Accredited 3rd Party Certification confirming compliance to ASTM E 2634 – Standard Specification for Flat Wall Insulating Concrete Forms and verification that the system meets all testing and documentation requirements for use in Types I through V construction as qualified under the governing Building Code for this project as well as additional compliances as outlined in Section 1.4.C.3. (below).
3. Documentation as provided per Section 1.4.C.1. or 2. above: shall verify compliance to the following regulatory documents and standards:
 - a. Form system structural, and general performance assessment of properties of EPS foam and polypropylene materials assessment in accordance with the following standards:
 - 1) ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation (which includes results for);
 - 2) ASTM C165 - Standard Test Method for Measuring Compressive Properties of Thermal Insulation.
 - 3) ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 - 4) ASTM C203 - Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation.
 - 5) ASTM C272 - Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
 - 6) ASTM C303 - Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation.
 - 7) ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 8) ASTM D1621 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.
 - 9) ASTM D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.
 - 10) ASTM D2126 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
 - 11) ASTM D2863 - Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index).
 - 12) ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
 - b. Finish attachment testing in accordance with:
 - 1) ASTM D1761: Standard Test Methods for Mechanical Fasteners in Wood (Modified for Polypropylene Web assessment).
 - c. Surface Burning, Flash Ignition and Self Ignition Temperature Characteristics assessment of both plastic web and EPS form materials in accordance with:
 - 1) ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and of Burning of Plastics in a Horizontal Position.
 - 2) ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 3) ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics.
 - d. Verification of performance and compliance of finishes for provision thermal barrier protection to foam plastic:
 - 1) NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth, or;
 - 2) UBC 26-3 - Room Fire Test Standard for Interior Foam Plastic Systems.
 - e. Fire Resistance Rated Construction assessment in accordance with:

- 1) UL 263: Fire Tests of Building Construction and Materials.
- f. Non-Combustible Construction assessment (i.e. approved non-combustible material finish requirement documentation) in accordance with:
 - 1) NFPA 259 - Standard Test Method for Potential Heat of Building Materials.
 - 2) NFPA 268 - Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source.
- g. Assessment of non-combustible finishes verifying exterior protection of foam plastic insulation in accordance with one of the following standards:
 - 1) NFPA 285: Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.
 - 2) UBC 26-4: Method of Test for the Evaluation of Flammability Characteristics of Exterior, Non-load-bearing Wall Panel Assemblies Using Foam Plastic Insulation, or;
 - 3) UBC 26-9: Method of Test for the Evaluation of Flammability Characteristics of Exterior, Non-load-bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multi-Story Test Apparatus
- h. Additional Testing and engineering documentation to verify qualification of EPS foam panels as a Vapor Retarder in conjunction with testing to:
 - 1) ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- i. Testing and engineering documentation to verify qualification of fully assembled wall system as an air barrier element in accordance with:
 - 1) ASTM E1677 - Standard Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls.
- j. Testing and engineering documentation to verify qualification of the form system as meets the minimum STC performance requirements of 50 in accordance with:
 - 1) ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements, or;
 - 2) ASTM E 336: Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings.

1.5 PERFORMANCE REQUIREMENTS

- A. Conform to the applicable building code requirements of regulatory agencies having jurisdiction.
- B. Selected system in conjunction with concrete and designated exterior and interior finishes shall provide minimum insulation level of R 23.59 (hr.ft².F/Btu) across full line of form unit cavity widths.
- C. *EPS* foam panels forming part of wall system shall provide maximum vapor permeation rate of 0.78 Perm-inch based on 2 5/8-inches single thickness of foam on interior surface of concrete core.
- D. Finished wall assembly formed by system shall provide minimum sound transmission class (STC) sound attenuation performance as follows:
 1. 6-inch core form: STC 50 (with regular ½-inch gypsum board both sides).
- E. The ICF's EPS insulation boards shall either have a flame spread index of 25 or less and smoke developed index of 450 or less (per ASTM E84) or shall have passed a NFPA 286 test.

- F. Finished ICF wall assemblies shall provide fire resistance ratings tested and documented by an Accredited Third Party as follows:
 - 1. For concrete core thickness of 4-inches: 2 hour fire resistance rating.
- G. ICFs' Cross-Ties' Fastener Withdrawal and Lateral Shear Resistance in accordance with ICC-ES AC308, Acceptance criteria for Stay-in-Place, Foam Plastic Insulating Concrete Form (ICF) Systems for Solid Concrete Walls and ASTM D1761, Standard Test Methods/or Mechanical Fasteners in Wood.

1.6 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit ICF manufacturer's literature describing products and installation procedures.
- C. Test Reports: Contractor shall submit a copy of valid ICF Product's evaluation report demonstrating compliance with this Section and applicable Codes.
- D. *Form Alignment System* Engineering: For wall heights above 12 feet of unsupported wall height, the contractor shall provide scaffold engineering prepared by a professional Engineer registered in the State of Michigan for support of the *Form Alignment System* for support of the form system and the *Form Alignment System* assemblies during construction. Form alignment engineering submittal shall be "sealed" by design Engineer.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Where project scope permits, form units shall be supplied through an authorized distributor of the Manufacturer listed for the bid. The distributor shall be capable of providing product on site within 24 hours notice.
- C. The Manufacturer's authorized distributor shall have available local to the region, technical sales staff that can be contacted or even contracted (under separate contract) as may be required to provide timely on site problem resolution as installation or product supply issues may arise.
- D. Where local distribution cannot service ~~to~~ the requirements of the contract scope and product is to be supplied directly by the manufacturer, the manufacturer shall provide on-site technical assistance as specified under Clause D of this section.
- E. Where product is supplied direct, technical assistance supplied by the manufacturer shall include the provision of a technical consultant direct from or contracted by the manufacturer for first week of contract that form product is to be erected on the site to coordinate form system installation, crew organization and set-up. During installation, (as agreed to with terms of contractor), the manufacturer's technical consultant shall provide periodic site visits (as may be required under separate contract) at key stages of form installation, to assure continued product installation quality.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver products in original factory packaging, bearing listing and leveling identification of product, manufacturer and lot number.
- C. Handle ICFs with care not to damage or soil any of the components.
- D. Store ICFs in well-ventilated areas away from high heat, ignition sources, and soils that may contain insects, in manufacturer provided packaging/bundles to prevent damage & soiling and to protect ICFs from extended exposure to UV (sun)light (or provide similar protection for unpackaged ICFs).

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Use appropriate measures for protection when required to ensure proper concrete curing conditions in accordance with ACI 305 and ACI 306 during periods of weather where temperatures are above or below minimum specified by the governing or local building code for concrete.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to installation.

1.11 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate work with affected trades for installation of items concealed with ICFs.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Provide insulating concrete form system materials from one of the following Manufacturers assuring that system selected complies in all respects with performance requirements of Sections 1.4 and 1.5.
 - 1. NUDURA Corporation.
 - 2. Substitutions permitted under provisions of Section 16 00 00 (pre-bid approval required).
- B. Substitution Limitations:
 - 1. Forming System shall carry an active listing/classification for fire resistance rating of the completed wall assembly as endorsed by Underwriters Laboratories® UL per testing to the ANSI/UL-263 Standard.
 - 2. Form System supplied shall provide full height webs fastening strips in contact throughout height of the wall assembly at 8-inches (203 mm) o/c placement within system to assure minimum settlement during concrete placement and maximum sleeve insertion diameter possible between webs.

3. Form system shall provide dovetail flutes to both sides of its interior cavity to enable structural bonding of concrete to foam once concrete is cured.

2.2 MATERIALS

- A. Insulating Concrete Forms:
 1. Expanded Polystyrene (EPS) Insulation Board as per ASTM C578.
 2. Form Units to comply with following out to out dimensions and concrete core widths:
 - a. 11 1/4" form width.
 - b. 18" form height.
 - c. 6" concrete core thickness.
 - d. 2 5/8" Thick EPS.
- B. Concrete: As specified in Section 03 30 00.
- C. Reinforcing: As specified in Section 03 20 00.
- D. Parging:
 1. Where called for on drawings, parging (acrylic stucco type) shall be as recommended and supplied by Concrete Form Manufacturer under this section and installed as specified under Section 09 24 00 (Portland Cement Plaster).

2.3 ACCESSORIES

- A. Form Alignment System:
 1. Installer shall furnish and utilize the Wall Access and *Form Alignment System* (as supplied by the Manufacturer or approved equivalent) to facilitate construction of the wall assembly, and to provide adjustment for ensuring plumbness and straightness of the wall system during construction, just prior to concrete placement and immediately after concrete placement while form system is still adjustable to final finished position.
 2. *Form Alignment System* shall be OSHA compliant. Manufacturer shall supply engineering documentation pertaining to the "base" *Form Alignment System* components to verify compliance upon request.
 3. As specified under Section 1.6 Submittals, for wall heights above 12-feet, the contractor shall provide scaffold engineering for *Form Alignment System* support and for support of the form system during construction.
- B. Window or Door Opening Buck Materials: Wood as specified in Section 06 10 00.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify footing installation conforms to requirements of 1/4" within level and that steps or elevation changes in footings are in 9" or 18" height increments.
- C. Verify dimensions of lines, levels and centers against for-construction building plans before proceeding with formwork installation.

- D. Verify that reinforcing steel dowels are in place at specified centers along footing lengths.

3.2 PREPARATION

- A. Section 01 30 00 - Administrative Requirements: Prepare existing substrate to receive work of this section.
- B. Remove all loose aggregate and foreign substances prior to commencement of insulating concrete form system installation.

3.3 INSTALLATION – GENERAL

- A. Install ICF formwork, reinforcing steel, and concrete per design requirements and in strict accordance with ICF manufacturer's installation instructions and all applicable codes and standards including, but not limited to, ACI 301, ACI 309, ACI 318, and ACI 347.
- B. Install and adjust ICF Bracing System to ensure stability and alignment of ICFs and formwork during all phases of work. Provide additional support for ICFs, Window and Door Opening Bucks and formwork where necessary.
- C. Ensure all required and recommended installation procedures are followed. Specifically the ICF Installer shall assure cross checks with respect to layout, level and vertical alignment are performed adequately and regularly.

3.4 INSTALLATION – FORMWORK

- A. Install the ICFs in accordance with ICF manufacturer's installation instructions, in a running bond pattern assuring placement and alignment of cross-ties / attachment strips.
- B. Install and secure Window and Door Opening Bucks. If specified, assure that the bucks have been prepared for anchoring to concrete as specified.
- C. Secure bottom layer of ICFs against displacement from footing or slab.
- D. Install *form alignment system* in strict accordance with ICF Bracing System manufacturer's installation instructions. Regularly check anchorage to ICF system as recommended by manufacturers, and for vertical alignment.
- E. Install reinforcing steel for lintels, as specified, over all wall openings.
- F. Install all sleeves, conduit, anchor bolts, hangars, embeds, and similar as specified.
- G. Install vertical reinforcing steel, as specified, within ICFs. Assure reinforcement diameter, grade and positioning complies with engineering specifications and is installed in correct position as detailed in the Drawings.
- H. Secure ICF corners, angles, T-walls and similar as necessary
- I. Secure top layer of ICFs against lateral movement along top edges.

- J. Clean formed cavities of all debris, snow, and ice prior to placing concrete. Flush with water above freezing-levels or use compressed air or other methods to remove remaining foreign matter. Ensure that water and debris drains to exterior through clean-out ports.
- K. Inspection before Concrete Placement: ICF Installer shall assure string lines are placed at top of all walls and the wall system is aligned for concrete placement; cross check and assure that all required service penetration sleeves, embed plates, anchor bolts, fittings, beam pocket preparations, as specified on drawings, are in place and secured prior to concrete placement.
- L. Concrete Placement: Place concrete and mechanically and internally vibrate per ACI standards after each concrete lift to assure full consolidation of concrete.
- M. ICF Bracing System, and scaffolding adjustment & removal: Maintain entire wall lengths are aligned to vertical plumb by string line and screeded to horizontal level for finished wall height as required prior to concrete set. Scaffolding and ICF Bracing System shall remain in place until top of wall is supported by roof construction, but no less than a period of seven days before removal.

3.5 INTERFACE WITH OTHER WORK

- A. Locate and set items to be cast directly into concrete.
- B. Provide formed openings, sleeves, pockets where required for items to be embedded in or to pass through concrete work.
- C. Coordinate with work of other trades in placing bolts, anchors, hangers, sleeves and any other inserts.
- D. Install components for wall, roof and/or floor connections as specified.
- E. Install all accessories in accordance with their manufacturer's instructions, straight, level and plumb. Secure items against displacement during the concrete placement.

3.6 FIELD QUALITY CONTROL

- A. Plumb, Straight, Square, and Level of all formwork and walls, before, during and after the concrete placement.
- B. Damaged ICFs: Installer shall clearly mark and segregate any damaged ICFs or ICF components to prevent their use in the project.

3.7 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean up and properly dispose of all debris remaining on job site related to the installation of the insulating concrete forms.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Reinforcing bars and fabric.
 - 2. Reinforcement accessories.

- B. Related Sections:
 - 1. Section 03 10 00 - Concrete Forming and Accessories.
 - 2. Section 03 11 19 – Insulating Concrete Forming.
 - 3. Section 03 30 00 - Cast-In-Place Concrete.
 - 4. Section 32 13 13 - Concrete Paving.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 318 - Building Code Requirements for Structural Concrete.
 - 2. ACI 530.1 - Specifications for Masonry Structures.

- B. ASTM International:
 - 1. ASTM A184/A184M - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
 - 2. A185/A185M-07 Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - 3. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

- C. American Welding Society:
 - 1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

- D. Concrete Reinforcing Steel Institute:
 - 1. CRSI - Manual of Standard Practice.
 - 2. CRSI - Placing Reinforcing Bars.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

- B. Product Data: Submit product data on fibrous reinforcement.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with CRSI - Manual of Standard Practice.

1.5 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

- B. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, deformed billet bars, uncoated finish.

2.2 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16 gage annealed type.

PART 3 EXECUTION

3.1 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position beyond specified tolerance.
- B. Do not displace or damage vapor retarder.
- C. Accommodate placement of formed openings.
- D. Maintain concrete cover around reinforcement in accordance with ACI 318 as follows:
 - 1. Concrete cast against earth: 3 inches.
 - 2. Formed concrete surfaces exposed to earth, weather or water: 2 inches.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete for the following:
 - 1. Strip and spread footings and foundation piers.
 - 2. Slabs on grade.
 - 3. Concrete fill for insulating concrete forming.

- B. Related Sections:
 - 1. Section 03 10 00 - Concrete Forming and Accessories: Formwork and accessories.
 - 2. Section 03 11 19 – Insulating Concrete Forming: Permanent forming for concrete walls.
 - 3. Section 03 20 00 - Concrete Reinforcing: Reinforcing rod and dowels.
 - 4. Section 03 35 00 - Concrete Finishing.
 - 5. Section 03 39 00 - Concrete Curing.
 - 6. Section 07 90 00 - Joint Protection.
 - 7. Section 32 12 13 - Concrete Paving: Sidewalks and stoops.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 305 - Hot Weather Concreting.
 - 3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
 - 4. ACI 318 - Building Code Requirements for Structural Concrete.

- B. ASTM International:
 - 1. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 2. ASTM C33 - Standard Specification for Concrete Aggregates.
 - 3. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 4. ASTM C42/C42M - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - 5. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
 - 6. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
 - 7. ASTM C150 - Standard Specification for Portland Cement.
 - 8. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
 - 9. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 - 10. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
 - 11. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
 - 12. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
 - 13. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - 14. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.

15. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
16. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
17. ASTM E154 – Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
18. ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.
19. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.3 PERFORMANCE REQUIREMENTS

- A. Vapor Retarder Permeance: Maximum 0.1 perms when tested in accordance with ASTM E154.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on joint devices, attachment accessories , and admixtures.
- C. Design Data:
 1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
 - a. Hot and cold weather concrete work.
 - b. Air entrained concrete work.
 2. Identify mix ingredients and proportions, including admixtures.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301 and ACI 318.
- B. Conform to ACI 305 when concreting during hot weather.
- C. Conform to ACI 306.1 when concreting during cold weather.
- D. Acquire cement and aggregate from one source for Work.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Maintain concrete temperature after installation at minimum 50 degrees F for minimum 7 days.

1.8 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type I – Normal and Type IA - Air Entraining.
- B. Normal Weight Aggregates: ASTM C33.
 - 1. Fine aggregate: size 2NS; clean, sharp, natural sand free from loam, clay lumps, or other deleterious substances.
 - 2. Intermediate Aggregates: sized in accordance with ACI 318.
 - 3. Coarse Aggregate: Maximum size in accordance with ACI 318.
 - 4. Aggregate shall be clean, uncoated, crushed stone, processed from natural rock or stone containing no clay, mud, loam, or foreign matter.
- C. Water: ACI 318; potable.
- D. Micro Rebar Reinforcing: Cold-drawn, twisted deformed steel wire meeting ASTM A820, Type 1. Provide Helix Micro-Rebar 5-25 as manufactured by Polytorex, LLC. Contact: 300 N. Fifth Avenue, Suite 130, Ann Arbor, MI 48104; Phone: 734-322-2114; Fax: 734-786-1644; Email: info@helixsteel.com; Web: www.helixsteel.com.
 - 1. Coating: Electroplated zinc 1.1 oz/ft² factory verified minimum.
 - 2. Ensure each wire fiber has one 360 degree twist minimum.
 - 3. Size: 0.02 inch equivalent diameter by 1 inch long.

2.2 ADMIXTURES

- A. Air Entrainment: ASTM C260.
- B. Chemical: ASTM C494/C494M.
- C. Fly Ash and Calcined Pozzolan: ASTM C618 Class F.
- D. Plasticizing: ASTM C1017/C1017M.

2.3 ACCESSORIES

- A. Vapor Retarder: ASTM E1745 Class B; 15 mil thick clear polyethylene film; type recommended for below grade application. Furnish joint tape recommended by manufacturer.
 - 1. Manufacturers:
 - a. Global Plastics Model VaporBlock 15.
 - b. Substitutions: Or Equal.
- B. Non-Shrink Grout: ASTM C1107/C1107M; 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 CONCRETE MIX

- A. Select proportions for concrete in accordance with ACI 318 trial mixtures, field experience, or both.
- B. Concrete TYPE A:

Material and Property	Measurement
Compressive Strength (28 day)	3,500 psi
Cement Type	ASTM C150
Aggregate Type	Normal weight
Water-Cement Ratio (maximum)	.45 by weight
Micro Rebar Reinforcing	4.5 lbs/yd ³
Air Content	Not air entrained
Fly Ash Content	None
Slump	5 inches plus or minus 1/2 inch

C. Concrete TYPE B:

Material and Property	Measurement
Compressive Strength (28 day)	3,500 psi
Cement Type	ASTM C150
Aggregate Type	Normal weight, maximum aggregate size = 3/8"
Water-Cement Ratio (maximum)	.45 by weight
Micro-Rebar Reinforcing	22.5 lbs/yd ³
Air Content	Not air entrained
Fly Ash Content:	4 to 6 percent
Slump	6 inches plus or minus 1/2 inch with super plasticizer / mid range water reducer agent.

D. Concrete TYPE C:

Material and Property	Measurement
Compressive Strength (28 day)	3,500 psi
Cement Type	ASTM C150
Aggregate Type	Normal weight
Water-Cement Ratio (maximum)	.45 by weight
Micro-Rebar Reinforcing	12.1 lbs/yd ³
Air Content	4 to 6 percent
Fly Ash Content:	20 percent of cementitious materials by weight, maximum
Slump	4 inches plus or minus 1 inch

E. Concrete TYPE D:

Material and Property	Measurement
Compressive Strength (28 day)	4,500 psi
Cement Type	ASTM C150
Aggregate Type	Normal weight
Water-Cement Ratio (maximum)	.45 by weight
Micro-Rebar Reinforcing	12/1 lbs/yd ³
Air Content	4 to 7 percent
Fly Ash Content:	20 percent of cementitious materials by weight, maximum
Slump	4 inches plus or minus 1 inch

- F. Admixtures: Include admixture types and quantities indicated in concrete mix designs only when approved by Architect/Engineer.
1. Use accelerating admixtures in cold weather. Use of admixtures will not relax cold weather placement requirements.
 2. Do not use calcium chloride nor admixtures containing calcium chloride.
 3. Use set retarding admixtures during hot weather.
 4. Add air entrainment admixture to concrete mix for work exposed to freezing and thawing or deicing chemicals.
 5. For concrete exposed to deicing chemicals, limit fly ash, pozzolans, silica fume, and slag content as required by applicable code.
- G. Micro-Rebar: add micro-rebar reinforcing to the mix in the amount indicated by concrete type.
- H. Average Compressive Strength Reduction: Not permitted.
- I. Ready Mixed Concrete: Mix and deliver concrete in accordance with ASTM C94/C94M.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Remove laitance, coatings, and unsound materials.
- B. Remove debris and ice from formwork, reinforcement, and concrete substrates.
- C. Remove water from areas receiving concrete before concrete is placed.

3.3 PLACING CONCRETE

- A. Place concrete in accordance with ACI 318.
- B. Notify testing laboratory minimum 24 hours prior to commencement of operations.
- C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.
- D. Install vapor retarder under interior slabs on grade in accordance with ASTM E1643. Lap joints minimum 6 inches and seal watertight by adhesive applied between overlapping edges and ends or by taping edges and ends with vapor retarder manufacturer recommended tape.
- E. Repair vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.
- F. Deposit concrete at final position. Prevent segregation of mix.
- G. Place concrete in continuous operation for each panel or section determined by predetermined joints.
- H. Consolidate concrete.
- I. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- J. Do not interrupt successive placement; do not permit cold joints to occur.
- K. Screed floors and slabs on grade level, maintaining overall surface flatness in accordance with Section 033500.
- L. Saw cut joints control joints within 12 hours after placing to pattern indicated in Plans (Generally 20' maximum on center spacing each way). Use saw blade with triangular arbor configuration to reduce edge raveling or dislodging aggregates, cut to 1/4 depth of slab thickness.

3.4 CONCRETE FINISHING

- A. Provide formed concrete surfaces to be left exposed with smooth rubbed finish.
- B. Finish concrete floor surfaces to requirements of Section 03 35 00.

3.5 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
 - 1. Protect concrete footings from freezing for minimum 5 days.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Cure floor surfaces as specified in Section 03 39 00.

3.6 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting and testing.
- B. Field inspection and testing will be performed by testing laboratory in accordance with ACI 318.
- C. Provide free access to Work and cooperate with appointed firm.
- D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.
- E. Strength Test Samples:
 - 1. Sampling Procedures: ASTM C172.
 - 2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, standard cured.
 - 3. Sample concrete and make one set of three cylinders for every 50 cu yds or less of each class of concrete placed each day and for every 5,000 sf of surface area for slabs and walls.
 - 4. When volume of concrete for any class of concrete would provide less than 5 sets of cylinders, take samples from five randomly selected batches, or from every batch when less than 5 batches are used.
 - 5. Make one additional cylinder during cold weather concreting, and field cure.
- F. Field Testing:
 - 1. Slump Test Method: ASTM C143/C143M.
 - 2. Air Content Test Method: ASTM C231.
 - 3. Temperature Test Method: ASTM C1064/C1064M.
 - 4. Measure slump, and temperature for each concrete load at point of delivery.
 - 5. Measure air content in air entrained concrete for each concrete load at point of delivery.
- G. Cylinder Compressive Strength Testing:
 - 1. Test Method: ASTM C39/C39M.
 - 2. Test Acceptance: In accordance with ACI 318.
 - 3. Test one cylinder at 7 days.
 - 4. Test two cylinders at 28 days.
- H. Core Compressive Strength Testing:
 - 1. Sampling and Testing Procedures: ASTM C42/C42M.
 - 2. Test Acceptance: In accordance with ACI 318.
 - 3. Drill three cores for each failed strength test from concrete represented by failed strength test.

- I. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.7 PATCHING

- A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.
- C. Do not patch, fill, touch-up, or repair concrete to remain exposed to view except upon express direction of Architect/Engineer for each repair.

3.8 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 Architect/Engineer.

3.9 SCHEDULES

- A. Concrete for interior floor slabs-on-grade: TYPE A.
- B. Concrete for insulating concrete formed walls: TYPE B.
- C. Concrete for building footings surrounding conditioned spaces: TYPE C.
- D. Concrete for portico footings subject to freeze thaw: TYPE D.
- E. Concrete for exterior stoops and sidewalks: Type C.

END OF SECTION

SECTION 03 35 00
CONCRETE FINISHING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Finishing concrete floors.
- B. Related Sections:
 - 1. Section 03 30 00 - Cast-In-Place Concrete: Prepared concrete floors ready to receive finish.
 - 2. Section 03 39 00 - Concrete Curing.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 302.1 - Guide for Concrete Floor and Slab Construction.
- B. ASTM International:
 - 1. ASTM E1155 - Standard Test Method for Determining Floor Flatness and of Levelness Using the F-number System.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on concrete hardener, compatibilities, and limitations.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301 and ACI 302.1.

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 with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Deliver materials in manufacturer's packaging including application instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Maintain ambient temperature of 50 degrees F minimum.

1.8 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate the Work with concrete floor placement and concrete floor curing.

PART 2 PRODUCT – Not Used

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify floor surfaces are acceptable to receive the Work of this section.

3.2 FLOOR FINISHING

- A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1.
- B. Steel trowel surfaces receiving overlay floor finish (carpeting, resilient flooring, seamless flooring, fluid applied flooring, thin-set floor tile).
- C. Steel trowel surfaces which are scheduled to be exposed.
- D. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains at 1/8 inch per foot nominal as indicated on Drawings.

3.3 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Measure for FF and FL tolerances for floors in accordance with ASTM E1155, within 48 hours after slab installation.
- C. Finish concrete to achieve the following tolerances:
 - 1. Concrete floors: FF 35 and FL 25.
- D. Correct slab surface when actual FF or FL number for floor installation measures less than required.

- E. Correct defects in defined traffic floor by grinding or removal and replacement of defective Work. Areas requiring corrective Work will be identified. Re-measure corrected areas by same process.

END OF SECTION

SECTION 03 39 00
CONCRETE CURING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes initial and final curing of horizontal and vertical concrete surfaces.
- B. Related Sections:
 - 1. Section 03 30 00 - Cast-In-Place Concrete.
 - 2. Section 03 35 00 - Concrete Finishing.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 302.1 - Guide for Concrete Floor and Slab Construction.
 - 3. ACI 308.1 - Standard Specification for Curing Concrete.
 - 4. ACI 318 - Building Code Requirements for Structural Concrete.
- B. ASTM International:
 - 1. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
 - 2. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - 3. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
 - 4. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on curing compounds, mats, compatibilities, and limitations.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301, ACI 302.1 and ACI 318.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Deliver curing materials in manufacturer's packaging including application instructions.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Membrane Curing Compound: ASTM C309, Type 1, Class A or ASTM C1315 Type 1, Class A.
- B. Absorptive Mats burlap-polyethylene, minimum 9 oz/sq yd bonded to prevent separation during handling and placing.
- C. Water: Potable, not detrimental to concrete.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify substrate surfaces are ready to be cured.

3.2 INSTALLATION - HORIZONTAL SURFACES

- A. Cure concrete in accordance with ACI 308.1.
- B. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.
- C. Spraying: Spray water over floor slab areas and maintain wet for 7 days.
- D. Absorptive Mat: Spread cotton fabric over floor slab areas. Spray with water until mats are saturated, and maintain in saturated condition for 7 days.
- E. Absorptive Mat: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place for 7 days.
- F. Membrane Curing Compound: Apply curing compound in one coat.

3.3 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished Work.
- B. Do not permit traffic over unprotected floor surface.

3.4 SCHEDULES

- A. Floor slabs schedule to receive concrete overlay, topping or applied floor finish: Cure by ponding, spraying or absorptive mats.
- B. Exterior Concrete Pavement: Membrane curing compound.

END OF SECTION

SECTION 05 52 00

METAL RAILINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes steel pipe railings and fittings.
- B. Related Sections:
 - 1. Section 09 90 00 - Painting and Coating: Paint finish.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

1.3 DESIGN REQUIREMENTS

- A. Design handrail and attachments to resist forces as required by applicable code. Apply loads non-simultaneously to produce maximum stresses.
 - 1. Handrail Concentrated Load: **200 pounds** applied at any point in any direction.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal requirements.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1.5 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 STEEL RAILING SYSTEM COMPONENTS

- A. Pipe: ASTM A53/A53M, Grade B, Schedule 40.
- B. Rails: 1-1/2 inch diameter steel pipe; welded joints.
- C. Splice Connectors: Steel concealed welding collars.
- D. Fittings: Elbows, T-shapes; matching rails.

- E. Wall brackets, escutcheons; cast steel.
- F. Mounting: Backing plate for mounting to wall construction.
- G. Anchors: Steel expansion type.

2.2 FABRICATION

- A. Fit and shop assemble components in largest practical sizes for delivery to site.
- B. Fabricate components with joints tightly fitted.
- C. Continuously seal joined pieces 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.

2.3 FINISH

- A. Powder Coat Paint Finish:
 - 1. Prepare steel for powder coating as recommend by coating manufacturer.
 - 2. Apply powder coating to uniform thickness using electrostatic spray equipment.
 - 3. Cure coating following coating manufacturer's instructions.
 - 4. Package powder coated items to protect finish during transportation and installation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify field conditions are acceptable and are ready to receive work.

3.2 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Anchor railings to structure with anchors.

3.3 ERECTION TOLERANCES

- A. Section 01 40 00 - 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 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes structural floor, wall, and roof framing; built-up structural beams and columns; floor, wall, and roof sheathing; preservative treatment of wood; miscellaneous framing and sheathing; telephone and electrical panel back boards; and concealed wood blocking for support of toilet and bath accessories, and wall cabinets.
- B. Related Sections:
 - 1. Section 03 11 19 – Insulating Concrete Forms: Window and door openings to receive wood blocking (bucks).
 - 2. Section 06 17 53 – Shop-Fabricated Wood Trusses.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A208.1 - Mat-Formed Wood Particleboard.
- B. American Wood-Preservers' Association:
 - 1. AWPA M4 - Standard for the Care of Preservative-Treated Wood Products.
 - 2. AWPA U1 - Use Category System: User Specification for Treated Wood.
- C. ASTM International:
 - 1. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 3. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 4. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- D. National Lumber Grades Authority:
 - 1. NLGA - Standard Grading Rules for Canadian Lumber.
- E. Southern Pine Inspection Bureau:
 - 1. SPIB - Standard Grading Rules for Southern Pine Lumber.
- F. U.S. Department of Commerce National Institute of Standards and Technology:
 - 1. DOC PS 1 - Construction and Industrial Plywood.
 - 2. DOC PS 2 - Performance Standard for Wood-Based Structural-Use Panels.
 - 3. DOC PS 20 - American Softwood Lumber Standard.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with the following:
 - 1. Lumber Grading Agency: Certified by DOC PS 20.
 - 2. Wood Structural Panel Grading Agency: Certified by EWA - The Engineered Wood Association.
 - 3. Lumber: DOC PS 20.
 - 4. Wood Structural Panels: DOC PS 1 or DOC PS 2.

- B. In lieu of grade stamping exposed to view lumber and wood structural panels, submit manufacturer's certificate certifying Products meet or exceed specified requirements.
- C. Fire Rated Wall, Floor, and Roof Construction: Rating as indicated on Drawings.
 - 1. Tested Rating: Determined in accordance with ASTM E119.
- D. Apply label from agency approved by authority having jurisdiction to identify each preservative treated material.

PART 2 PRODUCTS

2.1 LUMBER MATERIALS

- A. Lumber Grading Rules: NLGA.
- B. Beam Framing (2x6 through 4x16): SPF species, #2 grade or better, 19 percent maximum moisture content.
- C. Joist Framing: SPF species, #2 grade or better, 19 percent maximum moisture content.
- D. Rafter Framing: SPF species, #2 grade or better, 19 percent maximum moisture content.
- E. Non-structural Light Framing: SPF species, #2 grade or better, 19 percent maximum moisture content.
- F. Studding: SPF species, #2 grade or better, 19 percent maximum moisture content.
- G. Wall top plates bearing loads from trusses or rafters: SYP species, #2 grade or better, 19 percent maximum moisture content.
- H. Wall sill plates in contact with concrete: SYP species, #2 grade or better, 19 percent maximum moisture content, pressure preservative treated.
- I. Wall ledger plates supporting roof and/or floor trusses: SYP species, #2 grade or better, 19 percent maximum moisture content, pressure preservative treated.
- J. Miscellaneous Framing: SPF species, #2 grade or better, 19 percent maximum moisture content.

2.2 ENGINEERED LUMBER PRODUCTS

- A. Laminated Veneer Lumber: Gang-Lam LVL 2950Fb-2.0E as manufactured by LP Engineered Wood Products, or equal.
 - 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
 - 6. Sizes: As indicated on Plans.

2.3 SHEATHING MATERIALS

- A. Wood Structural Panel Roof Sheathing: EWA Rated Sheathing; Oriented Strand Board; Exposure Durability 1; unsanded.

- B. Wood Structural Panel Wall Sheathing: EWA Rated Sheathing, Oriented Strand Board; Exposure Durability 1; unsanded.
- C. Wood Structural Panel Wall Sheathing for installation within 8 inches of exterior finish grade: EWA Rated Plywood; Exposure Durability 1; unsanded, pressure preservative treated for ground contact.
- D. Wood Structural Panel Floor Sheathing: EWA Rated Sheathing Single Floor, Structural I, Oriented Strand Board; Exposure Durability 1; unsanded.
- E. Telephone and Electrical Panel Boards: Plywood.

2.4 UNDERLAYMENT MATERIALS

- A. Underlayment: Homasote 440 Sound Barrier panels. Molded recycled post-consumer paper, cellulose fiber structural panel.

2.5 SHEATHING AND UNDERLAYMENT LOCATIONS

- A. Sloped Roof Sheathing: 5/8 inch thick, Span Rating 40/20, 48 x 96 inch sized sheets, tongue and groove edges.
- B. Above Grade Wall Sheathing: 1/2 inch thick, Span Rating 32/16, 48 x 96 inch sized sheets, square edges, preservative treated when installed within 8 inches of exposed exterior grade.
- C. Floor Sheathing: 3/4 inch thick, Span Rating 24, 48 x 96 inch sized sheets, tongue and groove edges.
- D. Floor Underlayment: 3/4 inch thick, 48 x 96 inch sized sheets.

2.6 FIREBLOCKING AND DRAFTSTOPPING

- A. Fireblocking options: Solid lumber, structural wood panel, or particleboard.
 - 1. Solid lumber nominal 2 inches thick.
 - 2. Two layers of solid lumber nominal 1 inch thick with broken lapped joints.
 - 3. Structural wood panel 23/32 inch thick with joints backed by structural wood panel.
 - 4. Particleboard 3/4 inch thick with joints backed by particleboard.
- B. Draftstopping options: Gypsum board, wood structural panel or particleboard.
 - 1. Gypsum board, 1/2 inch thick.
 - 2. Wood structural panel, 3/8 inch thick.
 - 3. Particleboard, 3/8 inch thick.

2.7 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Fasteners: ASTM A153/A153M, hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
 - 2. Anchors: Epoxy screen tube and bolt for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt for anchorages to steel.
- B. Structural Framing Connectors: As indicated in the Drawings, hot dipped galvanized steel, sized to suit framing conditions.

- C. Subfloor Glue: EWA AFG-01, waterproof, air cure type, cartridge dispensed; PL 400 manufactured by Loctite.

2.8 FACTORY WOOD TREATMENT

- A. Wood Preservative (Pressure Treatment): AWPA U1, Commodity Specification A-Sawn Products or F-Wood Composites using water-borne preservative.
- B. Wood Preservative (Surface Application): Clear type, compatible with pressure treatment.
- C. Moisture Content After Treatment: Redried.
 - 1. Lumber: Maximum 19 percent.
 - 2. Structural Panels: Maximum 15 percent.

PART 3 EXECUTION

3.1 FRAMING

- A. Set structural members level and plumb, in correct position.
- B. Fasten framing in accordance with applicable code.
- C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.
- D. Place horizontal members, crown side up.
- E. Construct load bearing framing and curb members full length without splices.
- F. Double members at openings over 16 inches wide. Space short studs over and under opening to stud spacing.
- G. Construct double joist headers at floor and ceiling openings and under wall stud partitions parallel to floor joists. Frame rigidly into joists.
- H. Coordinate installation of shop-fabricated wood trusses.
- I. Coordinate curb installation with installation of decking and support of deck openings.
- J. Install structural framing connectors using quantity and size fasteners recommended by connector manufacturer.

3.2 SHEATHING

- A. Fasten sheathing in accordance with applicable code where not specifically indicated in the Drawings.
- B. Secure roof sheathing with longer edge (strength axis) perpendicular to framing members and with ends staggered and sheet ends over bearing.
- C. Fully engage tongue and groove edges.

- D. Secure wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered.
- E. Secure subfloor sheathing with longer edge perpendicular to floor framing and with end joints staggered and sheet ends over bearing. Attach with subfloor glue and screws.
- F. Install flooring underlayment after dust and dirt generating activities have ceased and prior to application of finished flooring. Apply perpendicular to subflooring, stagger joints of underlayment. Secure with fasteners recommended by manufacturer.
- G. Install telephone and electrical panel back boards where required. Size back boards to accommodate equipment mounting.

3.3 FIREBLOCKING AND DRAFTSTOPPING

- A. Install fireblocking to cut off concealed draft openings.
 - 1. Concealed Framed Wall and Furred Spaces: Install fireblocking vertically at floor and ceiling levels and horizontally at maximum 10 feet on center.
 - 2. Connections Between Horizontal and Vertical Spaces: Install fireblocking between vertical walls and partitions and the following:
 - a. Horizontal floor and roof framing.
 - b. Soffits, dropped ceilings, cove ceilings and other horizontal concealed spaces.
 - 3. Stairs: Install fireblocking between stair stringers at top and bottom of each run.
 - 4. Exterior Combustible Architectural Trim: Install fireblocking at maximum 20 feet on center.
- B. Install draftstopping in floors and attics at locations indicated on Drawings.

3.4 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Framing Members: 1/4 inch from indicated position, maximum.
- C. Surface Flatness of Floor: 1/4 inch in 10 feet maximum, and 1/2 inch in 30 feet maximum.

END OF SECTION

SECTION 06 17 53

SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes shop fabricated wood trusses for roof and floor framing; bridging, bracing, and anchorage; and preservative treatment of wood.
- B. Related Sections:
 - 1. Section 06 10 00 - Rough Carpentry.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 2. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - 3. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 4. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
 - 5. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 6. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 7. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- B. National Lumber Grades Authority:
 - 1. NLGA - Standard Grading Rules for Canadian Lumber.
- C. The Redwood Inspection Service:
 - 1. RIS - Standard Specifications for Grades of California Redwood Lumber.
- D. Southern Pine Inspection Bureau:
 - 1. SPIB - Standard Grading Rules for Southern Pine Lumber.
- E. Truss Plate Institute:
 - 1. TPI 1 - National Design Standard for Metal Plate Connected Wood Truss Construction.
- F. U. S Department of Commerce National Institute of Standards and Technology:
 - 1. DOC PS 1 - Construction and Industrial Plywood.
 - 2. DOC PS 2 - Performance Standard for Wood-Based Structural-Use Panels.
 - 3. DOC PS 20 - American Softwood Lumber Standard.
- G. West Coast Lumber Inspection Bureau:
 - 1. WCLIB - Standard Grading Rules for West Coast Lumber.
- H. Western Wood Products Association:
 - 1. WWPA G-5 - Western Lumber Grading Rules.

1.3 DESIGN REQUIREMENTS

- A. Design for roof and floor Live and Dead Loads indicated on Drawings with a deflection limit of 1/360 of span.
 - 1. Design for individual mechanical unit point loads as well as other loads indicated.
- B. Design trusses for maximum bearing pressure of 425 psi.
- C. Selection and specification of all truss to truss connectors appropriate to the connection condition and loading requirements is the responsibility of the Truss Designer.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate sizes and spacing of trusses and associated components, web and chord sizes, plate sizes, structural connectors, bearing surface area requirements, loads and truss cambers, framed openings, locations for temporary and permanent bridging and bracing.
- C. Submit design calculations.
- D. Truss submittals shall bear the seal of the Supervising Professional Structural Engineer.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with the following:
 - 1. Lumber Grading Agency: Certified by DOC PS 20.
 - 2. Lumber: DOC PS 20.
- B. Truss Design, Fabrication, and Installation: In accordance with TPI 1.
- C. Fire Rated Floor and Roof Construction: Rating as indicated on Drawings.
 - 1. Tested Rating: Determined in accordance with ASTM E119.
 - 2. Prescriptive Rating: Determined in accordance with 2015 Michigan Building Code.
- D. Surface Burning Characteristics:
 - 1. Fire Retardant Treated Materials: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Design trusses 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 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Store truss depth in vertical position resting on intermittent bearing pads.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide trusses fabricated with metal connector plates of one of the following:
 - 1. Letherer Truss and Wall Systems.
 - 2. Michigan Timber and Truss.
 - 3. Mid Michigan Truss & Components.
 - 4. Bear Truss.
 - 5. Truss Technologies.
 - 6. Midwest Manufacturing.
 - 7. Wendricks Truss
 - 8. Substitutions, or Equal.

2.2 MATERIALS

- A. Lumber Grading Rules: NLGA, SPIB, WCLIB, or WWPA G-5 as applicable.
- B. Wood Members: Any species graded under NLGA, SPIB, WWPA or WWPA; grade specified by Truss Designer; 19 percent maximum and 7 percent minimum moisture content.
- C. Steel Plate Connectors: TPI 1, Section 6; hot dip galvanized; die stamped with integral teeth; minimum coated metal thickness indicated, but not less than 0.036 inch thick.
- D. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.3 ACCESSORIES

- A. Wood Blocking, and Framing for Openings: In accordance with Section 06 10 00.
- B. Fasteners and Anchors:
 - 1. Fasteners: ASTM A153/A153M, hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
 - 2. Nails: ASTM F1667.
- C. Structural Connectors: Meeting requirements specified in Section 61 00 00, as selected by Truss Designer.

2.4 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 wood members to accurate length, 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 truss 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 members by metal connector plates accurately located and securely fastened to each side of wood members.
- G. Fabricate bottom and top chord extensions as indicated on Drawings.
- H. Frame special sized openings in web framing as indicated on Drawings.

2.5 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Inspect Work performed at fabricator's facility to verify conformance to Contract Documents.
- C. When fabricator is approved by authority having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
 - 1. Specified shop inspections are not required for Work performed by approved fabricator.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify supports and openings are ready to receive trusses.

3.2 PREPARATION

- A. Coordinate placement of bearing and support items.

3.3 ERECTION

- A. Do not install damaged trusses, or trusses with damaged web or chord members, or with loose metal connecting plates.
- B. Erect 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 alignment until completion of erection and installation of permanent bracing.
- E. During entire construction period, Contractors shall provide means of adequate distribution of concentrated loads so that the safe loading capacity of any single truss is not exceeded.
- F. Do not field cut or alter truss members without approval of the Truss Designer and Architect/Engineer of Record. Trusses that are cut, notched or otherwise altered shall be repaired as directed by the Truss Designer at the Contractor's expense.

- G. Exercise care during erection to minimize out-of-plane bending.
 - H. Anchor trusses at each bearing location using connectors indicated in Drawings or as specified by Truss Designer.
 - I. Do not anchor trusses directly to top plate of non-bearing partitions. Install designated slip connector between non-bearing partitions and trusses.
 - J. Frame openings between trusses with lumber in accordance with Section 06 10 00.
 - K. Install permanent bracing to enable trusses to maintain design spacing and position, withstand specified live and dead loads including lateral loads, and to comply with other indicated requirements.
 - 1. Roof Trusses: At a minimum, install pairs of 2x4 chevron bracing at maximum 20 foot intervals at all truss compression webs requiring permanent lateral bracing. Chevron 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 plane of the web and shall be in addition to continuous lateral bracing. Alternatively, Contractor may install T or L bracing in lieu of continuous lateral and chevron bracing on any member requiring bracing. T or L bracing shall be installed in accordance with BCSI recommendation.
 - L. Coordinate installation of sheathing with work of this Section.
- 3.4 ERECTION TOLERANCES
- A. Section 01 40 00 - Quality Requirements: Tolerances.
 - B. Framing Members: 1/2 inch maximum, from indicated position.
 - C. Trusses: 1/4 inch maximum from true position, 1/4 inch maximum from plumb.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior Finish Carpentry:
 - a. Standing and running trim.
- B. Related Requirements:
 - 1. Section 09 90 00 - Painting and Coating: Painting and finishing of finish carpentry items.

1.2 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 2. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- B. Architectural Woodwork Institute:
 - 1. AWI AWS - Architectural Woodwork Standards.

1.3 QUALITY ASSURANCE

- A. Perform work in accordance with AWI AWS Section 6 Custom Grade.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Fabricator: Company specializing in fabricating products specified in this section with minimum three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Protect work from moisture damage.
- C. Maintain storage space relative humidity within ranges indicated in AWI AWS Section 2.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. During and after installation of Work of this section, maintain same temperature and humidity conditions in building spaces as will occur after occupancy.
 - 1. Maintain relative humidity within ranges indicated in AWI AWS Section 2.

1.7 EXISTING CONDITIONS

- A. Verify field measurements prior to fabrication. Indicate field measurements on shop drawings.

PART 2 PRODUCTS

2.1 INTERIOR FINISH CARPENTRY

- A. Interior Standing and Running Trim: Softwood lumber, pre-primed, Idaho white pine, Grade II.
 - 1. Profile: Colonial.
 - 2. Finger Jointing: Permitted.
- B. Lumber Moisture Content Range: 5-10 percent.

2.2 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Fasteners: ASTM A153/A153M, hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
 - 2. Nails: ASTM F1667.
- B. Wood Filler: Water base, sandable, paintable.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify adequacy of backing and support framing.

3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Prime paint surfaces of wood items and assemblies to be in contact with cementitious materials.

3.3 INSTALLATION

- A. Install work in accordance with AWI AWS Section 6 and Custom Grade and manufacturer's instructions.
- 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.
- E. Preparation For Site Finishing:

1. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
2. Site Finishing: Refer to Section 09 90 00.

3.4 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation from Indicated Position: 1/16 inch.
- C. Maximum Offset from Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 40 00
PVC COLUMN COVERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes expanded cellular PVC Columns.
- B. Related Sections:
 - 1. Section 09 90 00 – Painting.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate profiles and configuration of components, dimensions, joinery, fasteners and connectors.
- C. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- D. Samples: For each finish product specified, two samples, minimum size 4 inches square, representing actual product, color, and patterns.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
- C. Columns shall be stored in the manufacturer's packaging until ready for use. If necessary to remove from crates, store in crated position with duplicate supports as originally crated.
- D. Capitals and bases shall be stored in the manufacturer's packaging until ready for use.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

- B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's limits.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Melton Classics, Inc.; P.O. Box 465020, Lawrenceville, GA 30045.
Toll Free Telephone: (800) 963-3060, Telephone: (770) 963-3060, Fax: (770) 962-6988,
www.MeltonClassics.com.
 - 1. Or equal.

2.2 COLUMN COVERS

- A. MeltonCraft™ Cellular PVC Columns:
 - 1. Column Style: Custom.
 - 2. Column Cap and Base Style: Custom.
 - 3. Column Bottom Shaft Diameter or Width: Refer to Drawings.
 - 4. Column Top Shaft Diameter or Width: Refer to Drawings.
 - 5. Column Overall Height: Refer to Drawings.

2.3 MATERIALS

- A. PVC: Expanded cellular PVC – 3/8" to 5/8" (Thickness varies depending on size and design.)

2.4 FABRICATION

- A. PVC Fabrications:
 - 1. Column panels expanded cellular PVC with mitered edges.
 - 2. Cap and base parts, expanded cellular PVC or polyurethane.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Do not begin installation until substrates have been properly prepared.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Field finish in accordance with 09 90 00.

3.4 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation From Indicated Position: 1/4 inch.
- C. Maximum Variation from Plumb: 1/4 inch.

3.5 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect installed products until completion of project.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 06 61 16
SOLID SURFACING FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Cast plastic window stools.
 - 2. Vanity tops with integral sinks.
 - 3. Kitchen countertops and sinks.

- B. Related Sections:
 - 1. Section 07 90 00 - Joint Protection: Perimeter sealant to adjacent construction.
 - 2. Section 12 35 30 – Residential Casework.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

- B. Samples: Submit samples illustrating color, texture, and finish for selection

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

- B. Operation and Maintenance Data: Submit list of approved cleaning materials and procedures required; list of substances harmful to component materials. Include instructions for stain removal, surface and gloss restoration.

1.5 QUALITY ASSURANCE

- A. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

- B. Verify field measurements are as indicated on shop drawings.

1.8 SEQUENCING

- A. Section 01 10 00 - Summary: Work sequence.
- B. Sequence Work to permit installation of adjacent affected construction.

PART 2 PRODUCTS

2.1 PLASTIC FABRICATIONS

- A. Manufacturer's
 - 1. DuPont Company; Product: Corian as Basis of Design.
 - 2. Samsung Chemical USA.
 - 3. Wilsonart Contract
 - 4. Or equal.

2.2 MATERIALS

- A. Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment; not coated, laminated or of composite construction; meeting following criteria:
 - 1. Flammability: Class 1 and A when tested to UL 723.
- B. Adhesive for Bonding to Other Products: One component silicone to ASTM C920.
- C. Sink/Bowl Mounting Hardware: Manufacturer's approved bowl clips, brass inserts and fasteners for attachment of undermount sinks/bowls.
- D. Heat Reflecting Tape: Manufacturer's standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.
- E. Insulating Nomex[®] Fabric: Manufacturer's standard for use with conductive tape in insulating solid surface material from adjacent heat source.

2.3 COMPONENTS

- A. Window Sills: 1/2" thick solid surfacing material, adhesively joined with inconspicuous seams, edge details as indicated on Drawings. Color selected later by Architect from manufacturer's full color range.
- B. Counter Perimeter Frame: Ensure 3/4" thick, moisture resistant cores for counter tops in wet areas having sinks or lavatories are 3/4" thick exterior grade plywood with waterproof adhesive, Fir or Poplar plywood, veneer core only.
- C. Lavatory Tops with Integral Bowls: Molded countertop of solid polymer material 22", complete with integrally molded bowl of solid polymer material. Provide with coved backsplash and endsplashes as shown on Drawings; color as selected by Owner.
 - 1. Lavatories in Building 4 Units E & H shall comply with ADA requirements.
- D. Kitchen Tops with Integral Bowls: 1/2" 3/4" thick countertop of solid polymer solid surfacing material. Provide countertops complete with coved backsplashes of size shown on Drawings; color as selected by Owner.

- E. Under-mount Kitchen Sinks:
 - 1. Building 3, 5 & 6 (All Units): Model 850 by Corian.
 - 2. Building 4 (all units except E and H): Model 850 by Corian.
 - 3. Building 4 (Units E & H): Model 5610 by Corain.

2.4 FABRICATION

- A. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved Shop Drawings and solid polymer manufacturer requirements. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints. Provide factory cutouts for plumbing fittings and bath accessories as indicated on Drawings.
- B. Where indicated, thermoform corners and edges or other objects to shapes and sizes indicated on Drawings, prior to seaming and joining. Cut components larger than finished dimensions and sand edges to remove nicks and scratches. Heat entire component uniformly prior to forming.
- C. Ensure no blistering, whitening and cracking of components during forming.
- D. Fabricate backsplashes from solid surfacing material with optional radius cove where counter and backsplashes meet.
- E. Fabricate joints between components using manufacturer's standard joint adhesive. Ensure joints are inconspicuous in appearance and without voids. Attach 50 mm (2") wide reinforcing strip of solid polymer material under each joint. Reinforcing strip of solid polymer material is not required when using DuPont™ Joint Adhesive 2.0.
- F. Provide holes and cutouts for plumbing and bath accessories as indicated on Drawings.
- G. Rout and finish component edges to a smooth, uniform finish. Rout cutouts, then sand edges smooth. Repair or reject defective or inaccurate work.
- H. Finish: Ensure surfaces have uniform finish:
 - 1. Matte, with a 60° gloss rating of 5 - 20.

2.5 SHOP FINISHING

- A. Color: as selected.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Verify actual site dimensions and location of adjacent materials prior to commencing work. Verify actual site dimensions and location of adjacent materials prior to commencing work.

- D. Examine cabinets upon which counter tops are to be installed. Verify cabinets are level to within 1/8" in 10' - 0".
- E. Notify Architect in writing of any conditions which would be detrimental to installation.

3.2 INSTALLATION

- A. Install components plumb, level, rigid, scribed to adjacent finishes in accordance with reviewed Shop Drawings and Product installation details.
- B. Fabricate field joints using manufacturer's recommended adhesive, with joints being inconspicuous in finished work. Exposed joints/seams are not permitted. Keep components and hands clean when making joints. Reinforce field joints as specified herein. Cut and finish component edges with clean, sharp returns.
- C. Route radii and contours to template. Anchor securely to base component or other supports. Align adjacent components and form seams to comply with manufacturer's written recommendations using adhesive in color to match work. Carefully dress joints smooth, remove surface scratches and clean entire surface.
- D. Install countertops with no more than 1/8" sag, bow or other variation from a straight line.
- E. Adhere undermount sinks/bowls to countertops using manufacturer's recommended adhesive and mounting hardware.
- F. Seal to adjacent construction in accordance with Section 07 90 00.
- G. Provide backsplashes and endsplashes as indicated on Drawings. Adhere to countertops using a standard color-coordinated silicone sealant. Adhere applied sidesplashes to countertops using a standard color-matched silicone sealant. Provide coved backsplashes and sidesplashes at walls and adjacent millwork. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown on reviewed Shop Drawings. Adhere to countertops using manufacturer's standard color-coordinated joint adhesive.
- H. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Ensure components are clean on date of Substantial Completion of the Work.
- I. Coordinate connections of plumbing fixtures.

3.3 REPAIR

- A. Repair minor imperfections and cracked seams and replace areas of severely damaged surfaces in accordance with manufacturer's "Technical Bulletins".

3.4 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation From Indicated Dimension: 1/16 inch.
- C. Maximum Offset From Indicated Position: 1/16 inch.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Clean fabrication surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 07 21 16
BLANKET INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes batt insulation and vapor retarder in floor/ceiling and roof construction.
- B. Related Sections:
 - 1. Section 07 21 26 - Blown Insulation.
 - 2. Section 07 26 00 – Vapor Retarders.
 - 3. Section 07 84 00 - Firestopping.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 3. ASTM E970 - Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source.

1.3 SYSTEM DESCRIPTION

- A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements in conjunction with thermal insulating materials in Section 03 11 19, and 07 21 26.
- B. Materials of This Section: Provide thermal protection to vapor retarder in conjunction with vapor retarder materials in Section 07 26 00.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on product characteristics, performance criteria, and limitations.

1.5 QUALITY ASSURANCE

- A. Insulation Installed in Concealed Locations Surface Burning Characteristics:
 - 1. Batt Insulation: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
- B. Insulation Installed in Exposed Locations Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
 - 1. Attic Insulation: Minimum 0.12 watt per sq cm critical radiant flux when tested in accordance with ASTM E970.

1.6 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate the Work with Section 07 21 26 for blown insulation and 07 26 00 for installation of vapor retarder.

PART 2 PRODUCTS

2.1 BATT INSULATION

- A. Manufacturers:
 - 1. Owens Corning Fiberglas
 - 2. Or equal.

2.2 COMPONENTS

- A. Batt Insulation: ASTM C665; preformed glass fiber batt or roll; friction fit, conforming to the following:
 - 1. Thermal Resistance: R of 30
 - 2. Batt Size: 19.2 width.
 - 3. Facing: Faced on one side with asphalt treated mesh reinforced Kraft paper.
- B. Batt Insulation: ASTM C665; preformed glass fiber batt; friction fit, conforming to the following:
 - 1. Thermal Resistance: R of 49.
 - 2. Batt Size: 24 x 48 inch.
 - 3. Facing: Unfaced.
- C. Batt Insulation: ASTM C665; preformed glass fiber roll; friction fit, conforming to the following:
 - 1. Thermal Resistance: R of 13.
 - 2. Roll Size: 16 inch width.
 - 3. Facing: Unfaced,
- D. Sheet Vapor Retarder: As specified in section 07 26 00.
- E. Staples: Steel wire; type and size to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify substrate, adjacent materials, and insulation are dry and ready to receive insulation.

3.2 INSTALLATION

- A. Install in fire rated partitions, roof and floor/ceiling spaces without gaps or voids. Do not compress insulation.

- B. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- C. Insulate miscellaneous gaps and voids around door and window frames with cut pieces and cover with vapor retarder.
- D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation.
- E. Install faced insulation with factory applied vapor retarder membrane in contact with sheathing material. Lap ends and side flanges of membrane over framing members.
- F. Staple flanges in place at maximum 6 inches oc.
- G. Coordinate Work of this section with construction of vapor retarder specified in Section 07 26 00 and blown insulation specified in Section 07 21 16.

3.3 SCHEDULES

- A. Floor/Ceiling Insulation: R30 batt or roll, Faced.
- B. Fire Rated Partition Wall Insulation: R13 roll, unfaced.
- C. Roof Insulation: R49 batt, unfaced, in conjunction with blown insulation and separate vapor retarder.

END OF SECTION

SECTION 07 21 26
BLOWN INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes: attic loose insulation pneumatically placed through access holes.
- B. Related Sections:
 - 1. Section 07 21 16 – Blanket Insulation: Insulation batts installed at eave edges.
 - 2. Section 07 26 00 - Vapor Retarders: Vapor retarder materials adjacent to insulation.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C764 - Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation.
- B. Underwriters Laboratories of Canada:
 - 1. ULC S102.2 - Standard method of Test for Surface Burning Characteristics of Floor Coverings and Miscellaneous Materials and Assemblies.

1.3 SYSTEM DESCRIPTION

- A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements, in conjunction with Section 03 11 19, and 07 21 16.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on product characteristics, performance criteria, and limitations.

1.5 QUALITY ASSURANCE

- A. Insulation Installed in Concealed Locations Surface Burning Characteristics:
 - 1. Loose Fill Insulation: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ULC S102.2.
- B. Insulation Installed in Exposed Locations Surface Burning Characteristics:
 - 1. Other Loose Fill Insulation: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ULC S102.2.
- C. Apply label from agency approved by authority having jurisdiction to identify each package of cellulose loose fill insulation.

1.6 SEQUENCING

- A. Do not install blown insulation until other trades are completed.

- B. Prior to substantial completion, repair any disturbed areas with additional insulation.

PART 2 PRODUCTS

2.1 COMPONENTS

- A. Fiber Fill Insulation: ASTM C764, glass fiber type, bulk for pneumatic placement, total in-place R-value of 50.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify 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. Place insulation pneumatically, tight in trusses spaces achieve a minimum in-place R-value of 50.
- B. Place insulation against eave edge insulation batts, filling voids between batts with loose insulation. Do not impede natural attic ventilation from soffit.
- C. Place against and behind mechanical and electrical services within plane of insulation.
- D. Completely fill intended spaces. Leave no gaps or voids.

3.3 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Remove loose insulation residue.

END OF SECTION

SECTION 07 26 00
VAPOR RETARDERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes sheet materials for controlling vapor diffusion.
- B. Related Sections:
 - 1. Section 07 21 16 – Blanket Insulation: Un-faced insulation requiring a vapor retarder.
 - 2. Section 07 21 26 – Blown Insulation: Loose insulation requiring a vapor retarder.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
 - 2. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- B. Sealant, Waterproofing and Restoration Institute:
 - 1. SWRI - Sealant Specification.

1.3 PERFORMANCE REQUIREMENTS

- A. Vapor Retarder Permeance: Maximum 1 perm when tested in accordance with ASTM E96/E96M, desiccant method.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data indicating material characteristics, performance criteria, and limitations.

1.5 SEQUENCING

- A. Section 01 10 00 - Summary: Work sequence.
- B. Do not install vapor retarder until items penetrating vapor retarder are in place.

PART 2 PRODUCTS

2.1 VAPOR RETARDER

- A. Sheet Retarder: Polyethylene film for above grade application, 6 mil thick.

2.2 ACCESSORIES

- A. Tape: Polyethylene self-adhering type, 2 inch wide, compatible with sheet material.

- B. Attachments: Staples and/or adhesives compatible with sheet material substrate.

PART 3 EXECUTION

3.1 PREPARATION

- A. Remove loose or foreign matter capable of impairing adhesion.
- B. Clean and prime substrate surfaces to receive adhesive.

3.2 INSTALLATION

- A. Vapor Retarder For Truss Framed Roofs: Secure sheet retarder to truss faces with adhesive and/or staples. Lap edges and ends and seal with tape.
- B. Seal all laps and repair all tears or penetrations in vapor retarder with tape.

END OF SECTION

SECTION 07 31 13
ASPHALT SHINGLES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Asphalt shingles.
 - 2. Membrane flashing.
 - 3. Underlayment
- B. Related Sections:
 - 1. Section 07 62 00 – Sheet Metal Flashing and Trim.

1.2 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 2. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - 3. ASTM D2178 - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
 - 4. ASTM D3018 - Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules.
 - 5. ASTM D3462 - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
 - 6. ASTM D4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
 - 7. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.
 - 8. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- B. National Roofing Contractors Association:
 - 1. NRCA - The NRCA Steep Roofing Manual.
- C. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - Architectural Sheet Metal Manual.
- D. Underwriters Laboratories Inc.:
 - 1. UL 790 - Tests for Fire Resistance of Roof Covering Materials.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Samples: Submit samples of each shingle color indicating color range and finish texture/pattern; for color and texture selection.

1.4 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

- B. Furnish fifty year manufacturer warranty period for asphalt shingles.
- C. Warranty Supplement: Provide manufacturer's supplemental warranty to cover labor and materials in the event of a material defect in the first ten years after completion of installation of shingles.

1.5 EXTRA MATERIALS

- A. Section 01 70 00 – Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Provide 5% extra shingles in color installed.

PART 2 PRODUCTS

2.1 ASPHALT SHINGLES

- A. Manufacturer:
 - 1. Certain Teed Corporation; Model Landmark Premium
 - 2. Substitutions: Permitted under provision of Section 00 21 13. Substitutions will only be considered where substituting manufacturer provides written warranty substantively equal to specified manufacturers warranty for shingles installed over a non-ventilated insulated deck.
- B. Description: ASTM D3018 Type 1 – Self-Sealing; ASTM D3462; ASTM D3161 Class F Wind Resistance; ASTM D7158 Class H Wind Resistance; ASTM E108 / UL 790 Class A Fire Resistance; glass fiber mat base, ceramically colored / UV resistant mineral surface granules across entire face of shingle; algae-resistant 300 lb/100 sq ft weight; self-sealing; laminated overlay type; color as selected.

2.2 SHEET MATERIALS

- A. Ice Barrier Membrane: ASTM D1970; self adhering polymer modified bituminous sheet material, slip resistant surface, 40 mils thick, 36 inches wide, with strippable release paper to expose adhesive surface; Winterguard HT as manufactured by Certainteed, or shingle manufacturer approved equivalent.
- B. Underlayment: Synthetic polymer-based scrim-reinforced underlayment complying with physical property requirements of ASTM D226 and ASTM D486, including resistance to liquid water transmission; Diamond Deck as manufactured by Certainteed, or shingle manufacturer approved equivalent

2.3 RIDGE VENTS

- A. Ridge Vents: Plastic, nominal 11 inches wide with vent openings that do not permit direct water or weather entry; to receive cap shingles; minimum 12 sq inches/foot net free area:
 - 1. Ridge Vent: 11" Ridge Master Plus manufactured by Mid-America Building Products, Tapco International.

2.4 ACCESSORIES

- A. Flashing and Drip Edge Materials:
 - 1. As specified in Section 07 62 00.

- B. Nails: ASTM F1667; standard round wire roofing nails hot dipped galvanized steel type, minimum 0.105 inch diameter shank, minimum 0.375 inch diameter head; of sufficient length to penetrate through roof sheathing.
- C. Plastic Cement: ASTM D4586, Asphalt type with mineral fiber components, free of toxic solvents, capable of setting within 24 hours at temperatures of 75 degrees F and 50 percent RH.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify roof penetrations and plumbing stacks are flashed to deck surface.
- C. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Fill knot holes and surface cracks with latex filler at areas of bonded underlayment and/or membrane flashing.
- C. Broom clean deck surfaces under underlayment.

3.3 INSTALLATION

- A. Installation shall be in strict accordance with the manufacturer's installation instructions for the materials specified.
- B. Ice Barrier Membrane:
 - 1. Install eave membrane directly on the roof deck in strict accordance with manufacturer's recommendations where indicated in Drawings. Weather lap subsequent rows of membrane as recommended by manufacturer. Overlap subsequent underlayment as recommended by manufacturer.
 - 2. Install valley membrane directly on the roof deck in strict accordance with manufacturer's recommendations extending from valley line a minimum of one and one half sheet widths upslope each side of valley line, or as otherwise indicated in Drawings. Install first sheet centered in valley. Weather lap subsequent rows of membrane as recommended by manufacturer. Overlap subsequent underlayment as recommended by manufacturer.
 - 3. Cut ice barrier to allow ventilation as hips and ridges.
- C. Underlayment Installation:
 - 1. Weather lap over ice barrier membrane as recommended by manufacturer. Lap ends minimum 2 inches. Nail underlayment in place.
 - 2. Weather lap and seal items projecting through or mounted on roof watertight with plastic cement.
 - 3. Cut underlayment to allow ventilation at hips and ridges.

- D. Ridge Vent:
 - 1. Install hip and ridge vent in accordance with manufacturer's instructions.
 - 2. Install hip and ridge vent continuous, centered over ridge/hip line. Hold ridge and hip vent back 2 feet from hip and ridge ends.
 - 3. Secure in place with nails spaced as recommended by manufacturer.

- E. Metal Flashing and Accessories Installation:
 - 1. Install metal flashings over membrane flashing and underlayment.
 - 2. Apply plastic cement between metal flashing and roof underlayment.
 - 3. Weather lap joints minimum 2 inches and seal weather tight with plastic cement.
 - 4. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
 - 5. Secure in place with nails. Conceal fastenings.
 - 6. Seal metal joints watertight with plastic cement.

- F. Asphalt Shingles Installation:
 - 1. Install shingles following manufacturer's recommendation for steep slopes using 6 nails per shingle.
 - 2. Install color matching starter strip at eaves.
 - 3. Place shingles in straight coursing pattern with weather exposure recommended by manufacturer to produce double thickness over full roof area.
 - 4. Extend shingles on one slope across valley and fasten. Trim shingles from other slope 2 inches from valley center line to achieve closed cut valley, concealing valley protection.
 - 5. Cap hips and ridges with individual shingles, maintaining manufacturer's recommended weather exposure. Place to avoid exposed nails.
 - 6. Coordinate installation of roof mounted components or items projecting through roof with weather tight placement of flashings.
 - 7. Complete installation to provide weather tight service.

3.4 DEFECT ASSESSMENT AND REPAIR

- A. Inspect completed roof for the presence of nail-pops. Where encountered, remove penetrated shingle and replace with new. Carefully remove fasteners to allow removal of overlying shingle and fill holes where fasteners are removed from shingles to remain with sealant. Remove under-driven or otherwise improperly driven fasteners and fill fastener hole with sealant. Install new fasteners as recommended by manufacturer adjacent to previous holes.

- B. Inspect completed roof for the presence of exposed fasteners. Where fasteners (nail heads) are not concealed by the overlying shingles, underlying shingle is to be removed and replaced with new. Carefully remove fasteners to allow removal of underlying shingle and fill holes where fasteners are removed from shingles to remain with sealant. Install new fasteners as recommended by manufacturer adjacent to previous holes.

- C. Repair of nail pops and/or exposed fasteners by coating with sealant will not be accepted.

3.5 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

- B. Do not permit traffic over finished roof surface.

END OF SECTION

SECTION 07 46 33

PLASTIC SIDING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preformed vinyl siding for walls, and accessory components.
 - 2. Cellular PVC trim.
 - 3. Secondary moisture barrier over substrate.
- B. Related Sections:
 - 1. Section 07 90 00 – Joint Protection: Exterior sealants.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
 - 2. ASTM D 2244 – Standard Calculation for Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
 - 3. ASTM D3679 - Standard Specification for Rigid Polyvinyl Chloride (PVC) Siding.

1.3 SYSTEM DESCRIPTION

- A. System: Preformed vinyl siding of profiles and accessory trim as indicated on the drawings.

1.4 DESIGN REQUIREMENTS

- A. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; deflection of structural support framing.
- B. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Product Data: For each type of product specified. Include identification of materials, dimensions of individual components, installation instructions and available profiles, textures and colors.
- C. Samples: Submit two (2) samples of siding, illustrating finish color, sheen, and texture.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements..

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three (3) years documented experience.
- B. Installer: Company specializing in performing the work of this section with minimum three (3) years documented experience and/or as approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Store siding material off ground protected from weather, to prevent twisting, bending, or abrasion.
- C. Prevent contact with materials which may cause discoloration or staining.

1.8 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate the Work for installation of surrounding materials, soffits and sub-fascia components or materials.
- C. Coordinate the Work with installation of flashing components or materials.

1.9 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Provide Manufacturer Warranty to correct defective Work for degradation of panel finish including color fading caused by exposure to weather as defined and measured according to ASTM D 2244.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Provide siding and trim products by Certainteed Saint-Gobain.

2.2 SIDING MATERIALS

- A. Provide solid vinyl siding and accessories complying with ASTM D3679.
- B. Horizontal Vinyl Siding; Restoration Classic by Certainteed.
 - 1. Pattern: Horizontal double 5" select cedar clapboard.
 - 2. Texture: Wood grain.
 - 3. Thickness: 0.044 inch.
 - 4. Projection: 5/8 inch.
 - 5. Warranty: Limited Lifetime.
 - 6. Color: As selected.
- C. Vinyl Shake Siding: Northwoods Perfection Shingles by Certainteed.

1. Pattern: Single 7" straight edge perfection shingles.
 2. Texture: Wood grain.
 3. Projection: 3/4" inch.
 4. Warranty: Limited Lifetime.
 5. Color: As selected.
- D. Board and Batten Siding; Board and Batten by Certainteed.
1. Pattern: Single 8" rough cedar.
 2. Texture: Wood Grain.
 3. Projection: 1/2 inch.
 4. Warranty: Limited Lifetime.
 5. Color: As selected.
- E. Vinyl Stone: Stone Façade by Certainteed.
1. Pattern: Ledgestone.
 2. Texture: Stone.
 3. Warranty: 20 Year.
 4. Color: As Selected.

2.3 COMPONENTS

- A. Internal Corners: Same material, thickness, and finish as siding; profile to siding.
- B. External Corner Posts:
1. For Vinyl Siding: Same material and finish as siding, profile to suit siding.
 2. For Vinyl Shingles: Same material and finish as siding, profile to suit siding.
 3. For Vinyl Stone: Same material and finish as siding, profile to suit siding.
- C. Door and Window Trim: 3-1/2 inch lineal; same material, and finish as siding.
- D. Gable Trim: 5" lineal; same material, and finish as siding.
- E. Eave Trim and Band Board: 7-1/4 x 1 inch PVC Board, wood grain texture.
- F. Baseboard: 9-1/4 x 1 inch PVC Board, wood grain texture.
- G. Window Sills for Simulated Stone: Matching Stone Façade.
- H. Dentils: Rectangular polyurethane blocks, size as indicated.

2.4 ACCESSORIES

- A. Secondary Moisture Barrier: Secondary moisture barrier consisting of Spun bonded polyolefin sheeting, CertaWrap by Certainteed.
- B. Sealants: Specified in Section 07900. Manufacturer's standard type suitable for use with installation of system, color to match panel system.
- C. Fasteners: Screws appropriate for installation to ICF fastening fins. Exposed fasteners same finish as panel system.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install secondary moisture barrier in such a manner as to provide a continuous water resistive barrier behind the exterior wall veneer. Comply with manufacturers installation instructions.
- B. Install vinyl siding system on walls in accordance with manufacturer's instructions.
- C. Fasten siding to structural support; aligned, level, and plumb.
- D. Use concealed fasteners unless otherwise approved by Architect.

3.2 TOLERANCES

- A. Section 01 40 00 Quality Requirements.
- B. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.
- C. Maximum Variation from Plane or Location Indicated on Drawings: 1/8 inch.

3.3 CLEANING

- A. Section 01 70 00 Execution and Closeout Requirements.
- B. Remove site cuttings from finish surfaces.
- C. Clean and wash surfaces with mild soap and water; rinse with clean water.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes flashings and fabricated sheet metal items.
- B. Related Sections:
 - 1. Section 07 31 13 - Asphalt Shingles: Flashings and fabricated sheet metal items associated with shingle roofing.
 - 2. Section 07 46 33 – Plastic Siding: Sheet metal flashings associated with plastic siding.
 - 3. Section 07 90 00 - Joint Protection.

1.2 REFERENCES

- A. American Architectural Manufacturers Association:
 - 1. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
- B. ASTM International:
 - 1. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 2. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction.
 - 3. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
 - 4. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - 5. ASTM D4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- C. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - Architectural Sheet Metal Manual.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on manufactured components metal types, finishes, and characteristics.
- C. Samples:
 - 1. Submit two samples illustrating metal finish color.

1.4 QUALIFICATIONS

- A. Fabricator and Installer: Company specializing in sheet metal work with minimum three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

- B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials causing discoloration or staining.

1.6 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate with Work of 07 31 13 and 07 46 33.

PART 2 PRODUCTS

2.1 COMPONENTS

- A. Manufacturer's
 - 1. Alcoa Aluminum
 - 2. Substitutions: Or equal.
- B. Drip edge: Standard weight; 1/2 inch hem x 1-1/2 inch drop; fabricated from 0.019 inch pre-finished aluminum sheet, color to match existing.
- C. Soffit - perforated: Triple 4 inch Full Lanced U-groove Soffit; fabricated from 0.019 inch pre-finished aluminum sheet, color to match existing. Soffit shall provide a minimum net free area of 13.2 inches per square foot.
- D. Soffit - solid: Triple 4 inch Solid U-groove Soffit; fabricated from 0.019 inch pre-finished aluminum sheet, color to match existing.
- E. Fascia: 6 inch ribbed; fabricated from 0.024 inch pre-finished aluminum sheet, color to match existing.
- F. J-channel: 1 inch face, offset, for use with specified soffit; fabricated from 0.019 inch pre-finished aluminum sheet, color to match soffit.

2.2 SHEET METAL FLASHING

- A. Pre-Finished Aluminum Sheet: ASTM B209; 3003 alloy, H14 temper; 0.032 inch thick; plain finish shop pre-coated with silicone polyester top coat; color to match existing.
- B. Membrane Flashing: ASTM D1970; self-adhering polymer modified bituminous sheet material, 40 mils thick, 18 inches wide, with strippable release paper to expose adhesive surface; Roof Detail Membrane as manufactured by Grace or equal.

2.3 ACCESSORIES

- A. Fasteners: Same material and finish as flashing metal.
- B. Underlayment: ASTM D226; Type I, No. 15 unperforated asphalt felt.
- C. Sealant: Butyl sealant specified in Section 07 90 00.

2.4 FABRICATION

- A. Form sections shape indicated on Drawings, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

2.5 FACTORY FINISHING

- A. Silicone polyester coating: Baked enamel system conforming to AAMA 2603.
- B. Washcoat: Finish concealed side of metal sheets with washcoat compatible with finish system, as recommended by finish system manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set,
- C. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 INSTALLATION

- A. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- B. Weather lap membrane detail flashing over metal wall 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 07 71 23

MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes pre-finished aluminum gutters and downspouts.
- B. Related Sections:
 - 1. Section 07 62 00 - Sheet Metal Flashing and Trim.
 - 2. Section 07 90 00 - Joint Protection.

1.2 REFERENCES

- A. American Architectural Manufacturers Association:
 - 1. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - 2. AAMA 2604 - Voluntary specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
 - 3. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. ASTM International:
 - 1. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - Architectural Sheet Metal Manual

1.3 DESIGN REQUIREMENTS

- A. Conform to SMACNA Manual for sizing components for rainfall intensity determined by storm occurrence of 1 in 10 years.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.
- C. Product Data: Submit data on manufactured components, materials, and finishes.
- D. Samples: Submit two samples illustrating component design, finish, color, and configuration.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA Manual.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope to drain.
- C. Prevent contact with materials during storage capable of causing discoloration, staining, or damage.

1.7 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for gutter and downspout finishes.

PART 2 PRODUCTS

2.1 GUTTERS AND DOWNSPOUTS

- A. Manufacturers:
 - 1. Architectural Products Co.
 - 2. Substitutions: Or equal.
- B. Product Description:
 - 1. Gutters: Sheet metal; Rectangular style profile.
 - 2. Downspouts: Sheet metal; Rectangular profile.

2.2 COMPONENTS

- A. Pre-Finished Aluminum Sheet: ASTM B209, manufacturer's standard alloy and temper for specified finish; 0.032 inch thick; plain finish shop pre-coated with modified silicone coating; color as selected from manufacturer's standard colors.

2.3 ACCESSORIES

- A. Anchors and Supports: Profiled to suit gutters and downspouts.
 - 1. Anchoring Devices: Type recommended by fabricator.
 - 2. Gutter Supports: Brackets, straps, pikes and ferrules.
 - 3. Downspout Supports: Brackets and straps.
- B. Fasteners: Aluminum.

2.4 FABRICATION

- A. Form gutters and downspouts of profiles indicated.
- B. Fabricate with required connection pieces.

- C. Form sections to shape indicated on Drawings, square, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Hem exposed edges of metal.
- E. Fabricate gutter and downspout accessories; seal watertight.

2.5 FACTORY FINISHING

- A. Modified silicone polyester coating: Baked enamel system conforming to AAMA 2603.
- B. Primer Coat: Finish concealed side of metal sheets with primer compatible with finish system, as recommended by finish system manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify surfaces are ready to receive gutters and downspouts.

3.2 INSTALLATION

- A. Sheet Metal: Join lengths with formed seams, sealed watertight. Flash and seal gutters to downspouts and accessories.
- B. Slope gutters 1/8 inch per foot minimum.
- C. Discharge downspouts to grade.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Firestopping through-penetrations of fire rated assemblies.
 - 2. Firestopping joints in fire rated assemblies.
 - 3. Firestopping tops of fire rated walls.
 - 4. Smoke sealing penetrations and joints of smoke partitions.

- B. Related Sections:
 - 1. Section 09 21 16 - Gypsum Board Assemblies: Gypsum board fireproofing.
 - 2. Section 23 31 00 – HVAC Ducts and Casings: HVAC work requiring firestopping.
 - 3. Section 23 33 00 – Air Duct Accessories: HVAC work requiring firestopping.
 - 4. Section 26 00 01 – General Electrical Requirements: Electrical work requiring firestopping.
 - 5. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables (600 V and less): Electrical work requiring firestopping.
 - 6. Section 26 05 34 – Conduit: Electrical work requiring firestopping.
 - 7. Section 28 31 00 – Fire Detection and Alarm: Electrical work requiring firestopping.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
 - 4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

- B. Intertek Testing Services (Warnock Hersey Listed):
 - 1. WH - Certification Listings.

- C. Underwriters Laboratories Inc.:
 - 1. UL 263 - Fire Tests of Building Construction and Materials.
 - 2. UL 1479 - Fire Tests of Through-Penetration Firestops.
 - 3. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
 - 4. UL - Fire Resistance Directory.

1.3 DEFINITIONS

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 PERFORMANCE REQUIREMENTS

- A. Conform to applicable code for fire resistance ratings and surface burning characteristics.

- B. Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on product characteristics, performance and limitation criteria.
- C. Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
- D. Manufacturer's Installation Instructions: Submit preparation and installation instructions.
- E. Manufacturer's Certificate: Certify products meet or exceed applicable code requirements.
- F. Engineering Judgements: For conditions not covered by UL or WH listed designs, submit judgements by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.

1.6 QUALITY ASSURANCE

- A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
 - 1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.
 - 2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
 - a. Floor Penetrations Within Wall Cavities: T-Rating is not required.
- B. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.
 - 1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
 - 2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.
- C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
 - 1. Smoke Barrier Joints Air Leakage: Maximum 5 cfm per foot at 0.30 inches water gage pressure differential
- D. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years documented experience.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F.
- C. Maintain this minimum temperature before, during, and for minimum 3 days after installation of materials.
- D. Provide ventilation in areas to receive solvent cured materials.

PART 2 PRODUCTS

2.1 FIRESTOPPING

- A. Manufacturers:
 - 1. A/D Fire Protection Systems, Inc.
 - 2. Hilti Corp.
 - 3. 3M Fire Protection Products
 - 4. Nelson Firestop Products
 - 5. Specified Technologies
 - 6. United States Gypsum Co.
 - 7. Substitutions: Or equal
- B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
 - 1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
 - 2. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.
 - 3. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
 - 4. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
 - 5. Firestop Pillows: Formed mineral fiber pillows.
 - 6. Mortar as specified in Section 04 05 03 where permitted by applicable code.

2.2 ACCESSORIES

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.
- B. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify openings are ready to receive firestopping.

3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Install damming materials to arrest liquid material leakage.

3.3 APPLICATION

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.
- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.
- D. Compress fibered material to maximum 40 percent of its uncompressed size.
- E. Remove dam material after firestopping material has cured.

3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Clean adjacent surfaces of firestopping materials.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
- B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 90 00
JOINT PROTECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes sealants and joint backing and accessories.
- B. Related Sections:
 - 1. Section 07 84 00 - Firestopping: Firestopping sealants.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C834 - Standard Specification for Latex Sealants.
 - 2. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
 - 3. ASTM C1193 - Standard Guide for Use of Joint Sealants.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Products Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- C. Samples: Submit two samples illustrating sealant colors for selection.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years documented experience.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

1.6 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate Work with sections referencing this section.

PART 2 PRODUCTS

2.1 JOINT SEALERS

- A. Manufacturers:
 - 1. Dow Corning Corp.
 - 2. Pecora Corp..
 - 3. Sika Corp..
 - 4. Tremco Sealants & Waterproofing.
 - 5. Substitutions: Or equal.

- B. Products Description:
 - 1. Sealant S1 - High Performance General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25, Uses M, G, and A; multi-component.
 - a. Acceptable Products:
 - 1) Dymeric 240FC manufactured by Tremco.
 - 2) Sikaflex-2c NS manufactured by Sika Corp.
 - 3) Dynatrol II by Pecora Corporation.
 - 4) Or equal.
 - b. Color: Standard colors matching finished surfaces.

 - 2. Sealant S2 - Exterior Metal Lap Joint Sealant: Butyl, non-drying, non-skinning, non-curing.
 - a. Acceptable Products
 - 1) Butyl Sealant manufactured by Tremco.
 - 2) Pecora BA-98 manufactured by Pecora Corp.
 - 3) Or equal.

 - 3. Sealant S3 - Interior Silicone Sealant: Silicone; ASTM C920, Grade NS, Class 25, Uses M and A; single component mildew resistant.
 - a. Acceptable Products:
 - 1) Tremsil 200 manufactured by Tremco
 - 2) Dow Corning 786 manufactured by Dow Corning Corp.
 - 3) Pecora 898 manufactured by Pecora Corp.
 - 4) Or equal.
 - b. Color: Clear.

 - 4. Sealant S4 - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, single component, paintable.
 - a. Acceptable Products:
 - 1) TremFlex 834 manufactured by Tremco.
 - 2) Pecora AC-20 + Silcone manufactured by Pecora Corp.
 - 3) Or equal.
 - b. Color: White.

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: Round foam rod compatible with sealant; ASTM D1056, sponge or expanded rubber; oversized 30 to 50 percent larger than joint width.
 - 1. Type: Everlastic manufactured by Williams Products, Inc. or equal.

- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify substrate surfaces and joint openings are ready to receive work.
- C. Verify joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

- A. Remove loose materials and foreign matter impairing adhesion of sealant.
- B. Clean and prime joints.
- C. Perform preparation in accordance with ASTM C1193.
- D. Protect elements surrounding Work of this section from damage or disfiguration.

3.3 INSTALLATION

- A. Perform installation in accordance with ASTM C1193.
- B. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
 - 1. Width/depth ratio of 2: 1.
 - 2. Neck dimension no greater than 1/3 of joint width.
 - 3. Surface bond area on each side not less than 75 percent of joint width.
- C. Install bond breaker where joint backing is not used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Tool joints concave.

3.4 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Clean adjacent soiled surfaces.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
- B. Protect sealants until cured.

3.6 SCHEDULE

- A. Exterior joints for which no other sealant type is Indicated: Type S1.
- B. Lap Joints in Exterior Sheet Metal Work: Type S2.
- C. Interior Joints for Which No Other Sealant is Indicated: Type S4.
- D. Joints between counter tops and walls: Type S3.

END OF SECTION

SECTION 08 12 13
HOLLOW METAL FRAMES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes fire rated and non-rated steel frames.
- B. Related Sections:
 - 1. Section 07 90 00 – Joint Protection: Joint sealers.
 - 2. Section 08 13 13 – Hollow Metal Doors.
 - 3. Section 08 71 00 - Door Hardware: Hardware.
 - 4. Section 09 90 00 – Painting: Field painting of frames.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
- B. ASTM International:
 - 1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. National Fire Protection Association:
 - 1. NFPA 80 - Standard for Fire Doors, Fire Windows.
 - 2. NFPA 105 - Standard for the Installation of Smoke Door Assemblies and other Opening Protectives.
 - 3. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- D. Underwriters Laboratories Inc.:
 - 1. UL 10B - Fire Tests of Door Assemblies.
 - 2. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
 - 3. UL 1784 - Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate frame elevations, reinforcement, anchor types and spacing, location of cut-outs for hardware, and finish.
- B. Product Data: Submit frame configuration and finishes.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Conform to requirements of ANSI A250.8.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept frames on site in manufacturer's packaging. Inspect for damage.
- B. Break seal on-site to permit ventilation.

1.7 COORDINATION

- A. Coordinate Work with frame opening construction, door, and hardware installation.
- B. Sequence installation to accommodate required door hardware electric wire connections.

PART 2 PRODUCTS

2.1 STANDARD STEEL FRAMES

- A. Manufacturers:
 - 1. Amweld Building Products, Inc.
 - 2. Ceco Door Products
 - 3. [unbarton Corp.
 - 4. Kewanee Corp.
 - 5. Republic Builders Products
 - 6. Steelcraft
 - 7. Or equal
- B. Product Description: Standard shop fabricated steel frames, fire rated and non-rated types.
 - 1. Exterior Frames:
 - a. 16 gage/0.053 inch thick material, base metal thickness, galvanized.

2.2 ACCESSORIES

- A. Bituminous Coating: Non-asbestos fibered asphalt emulsion.
- B. Primer: ANSI A250.10 rust inhibitive type.
- C. Silencers: Resilient rubber fitted into drilled hole.
- D. Weatherstripping: Specified in Section 08 71 00.

2.3 FABRICATION

- A. Fabricate frames as welded unit.
- B. Fabricate frames with hardware reinforcement plates welded in place.
- C. Dimple frames for anchors – three anchors each jamb.
- D. Prepare frames for silencers. Provide three single silencers for single doors on strike side.
- E. Fabricate frames to match frame elevations depicted in plans.

2.4 SHOP FINISHING

- A. Steel Sheet: Galvanized to ASTM A653/A653M G60.
- B. Primer: Baked.
- C. Coat inside of frame profile with bituminous coating to minimum thickness of 1/16 inch.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify opening sizes and tolerances are acceptable.

3.2 INSTALLATION

- A. Install frames in accordance with ANSI A250.8.
- B. Anchor frames to surrounding construction using three anchors each jamb.
- C. Coordinate installation of frames with installation of hardware specified in Section 08 71 00 and doors in Section 08 13 13.
- D. Fill anchor dimples with automotive body filler (Bondo), and sand smooth.

3.3 ERECTION TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

3.4 SCHEDULE

- A. Refer to Door and Frame Schedule in drawings

END OF SECTION

SECTION 08 13 13
HOLLOW METAL DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes non-rated, thermally insulated, steel doors.
- B. Related Sections:
 - 1. Section 08 12 13 - Hollow Metal Frames.
 - 2. Section 08 71 00 - Door Hardware.
 - 3. Section 09 90 00 - Painting and Coating: Field painting of doors.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
- B. ASTM International:
 - 1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. Hollow Metal Manufacturers Association:
 - 1. HMMA 810 - Hollow Metal Doors.
- D. Steel Door Institute:
 - 1. SDI 108 - Recommended Selection and Usage Guide for Standard Steel Doors.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate door elevations, internal reinforcement, closure method, and cut-outs for glazing, and finishes.
- B. Product Data: Submit door configurations, location of cut-outs for hardware reinforcement.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ANSI A250.8.
- B. Surface Burning Characteristics:
 - 1. Foam Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
- C. Apply label from agency approved by authority having jurisdiction to identify each foam plastic insulation board.

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 with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept doors on site in manufacturer's packaging. Inspect for damage.
- B. Break seal on site to permit ventilation.

1.7 COORDINATION

- A. Coordinate Work with door opening construction, door frame, and door hardware installation.
- B. Coordinate installation to accommodate door hardware electric wire connections.

PART 2 PRODUCTS

2.1 HOLLOW METAL DOORS

- A. Manufacturers:
 - 1. Amweld Building Products, Inc.
 - 2. Ceco Door Products.
 - 3. Kewanee Corp.
 - 4. Pioneer Industries.
 - 5. Republic Builders Products.
 - 6. Steelcraft.
 - 7. Or equal.
- B. Product Description:
 - 1. Exterior Doors (Insulated): ANSI A250.8, SDI 108, 1-3/4 inch thick.
 - a. Level 3 - Extra heavy Duty, Model 1, full flush design.

2.2 COMPONENTS

- A. Face: Steel sheet in accordance with ANSI A250.
- B. End Closure: Channel, 0.04 inches thick, flush.
- C. Core: Polyurethane foam for insulated doors.
- D. Thermal Insulated Door: Total insulation R-Value of 11 calculated in accordance with ASTM C518.

2.3 ACCESSORIES

- A. Removable Stops: Rolled steel, channel shape, mitered corners; prepared for countersink style screws.

B. Primer: ANSI A250.10 rust inhibitive type.

2.4 FABRICATION

A. Fabricate doors with hardware reinforcement welded in place.

2.5 SHOP FINISHING

A. Steel Sheet: Galvanized to ASTM A653/A653M A60.

B. Primer: Baked.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify opening sizes and tolerances are acceptable.

3.2 INSTALLATION

A. Install doors in accordance with ANSI A250.8.

B. Coordinate installation of glass and glazing specified in Section 08 80 00.

C. Coordinate installation of doors with installation of frames specified in Section 08 12 13 and hardware specified in Section 08 71 00.

D. Touch-up damaged shop finishes.

3.3 ERECTION TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.4 ADJUSTING

A. Adjust door for smooth and balanced door movement and positive latching of locking hardware.

3.5 SCHEDULE

A. Refer to Door and Frame Schedule appended to this section.

END OF SECTION

SECTION 08 16 00

COMPOSITE (INTERIOR) DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Molded interior passage doors, bi-fold doors, and by-pass doors.
 - 2. Frames for pre-hung swinging doors.

- B. Related Sections:
 - 1. Section 06 10 00 – Rough Carpentry: Framed openings for doors.
 - 2. Section 06 20 00 – Finish Carpentry: Standing and Running trim for Doors.
 - 3. Section 08 71 00 – Door Hardware.
 - 4. Section 09 00 00 – Painting: Field finishing of doors.

1.2 REFERENCES

- A. Window & Door Manufacturers Association (WDMA):
 - 1. WDMA TM-7: Cycle Slam.
 - 2. WDMA TM-8: Hinge Loading.

- B. National Fire Protection Association (NFPA):
 - 1. NFPA 252: Standard Methods of Fire Tests of Door Assemblies.
 - 2. NFPA 80: Standard Methods for builders' hardware to be used in fire rated swing doors.

- C. Underwriters Laboratories, Inc. (UL):
 - 1. UL10B: Standard for Fire Tests of Door Assemblies (Note: Neutral pressure testing standard).
 - 2. UL 10C: Standard for Positive Pressure Fire Tests of Door Assemblies.

- D. ASTM International:
 - 1. ASTM E90 – Laboratory measurement of Airborne Sound Transmission of Building Partitions and Elements.
 - 2. ASTM E1332 – Standard Classification for Rating Outdoor – Indoor Sound Attenuation.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

- B. Shop Drawings: Indicate door elevations, internal reinforcement, closure method, and cut-outs for glazing, and finishes.

- C. Product Data: Submit door manufacturer current product literature, including installation instruction.

- D. Samples: Provide finish samples for all products.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver doors, materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store doors as recommended by manufacturer.

1.5 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Manufacturer's Standard Warranty: Assemblies will be free from defects in materials and workmanship from the date of manufacture for the time periods indicated below:
 - 1. Basic Product Coverage: Commercial: 5 years.
 - 2. Door Frames: 1 year.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Acceptable Manufacturer: JELD-WEN, Inc.; 2645 Silver Crescent Drive, Charlotte, NC 28273; Toll Free Tel: 800-535-3936; Tel: 541-850-2606; Fax: 541-851-4333; Email: architectural_inquiries@jeld-wen.com; Web: <http://www.jeld-wen.com>.
- B. Substitutions: Permitted under provisions of Section 01 60 00
- C. Basis of Design: Doors are based on JELD-WEN®'s Molded Interior Doors: Colonist.

2.2 PASSAGE DOOR

- A. Door Style:
 - 1. Door Type: All panel.
 - 2. Door Shape: Squared Top.
 - 3. SurfaceFinish: Textured.
 - a. Panels and Sticking Profile: Six panels, with Cove and Bead sticking.
- B. Core and Frame:
 - 1. Hollow core with MDF frame.
 - a. Thickness: 1-3/8 inch (35.1 mm).
- C. Hardware:
 - 1. Prep door for owner supplied lockset.
 - 2. Face Bore: Custom.
 - 3. Backset: Custom.
- D. Finish: Preprimed.

2.3 PREHUNG DOORS

- A. Profile:
 - 1. System 01, Single Door.
- B. Jambs:
 - 1. Jamb Width: 4-9/16 inch.
 - 2. Jamb Type: Split.
 - 3. Jamb Species: Finger-Jointed Pine.
- C. Hinges: SAE 1010 Carbon Steel.
 - 1. Size: 3-1/2 inch by 3-1/2 inch with 5/8 inch radius corners

2.4 BIFOLD DOORS

- A. Door Style:
- B. Surface Finish: Textured.
 - 1. Panels and Sticking Profile: Six panels, with Cove and Bead sticking.
- C. Core:
 - 1. Hollow core.
 - a. Thickness: 1-3/8 inch.
- D. Hardware:
 - 1. Finish: Satin Nickel.
- E. Finish: Preprimed.

2.5 BY-PASS DOORS

- A. Door Style:
 - 1. Door Type: All panel.
 - 2. Door Shape: Squared Top.
 - 3. Surface Finish: Textured.
 - a. Panels and Sticking Profile: Six panels, with Cove and Bead sticking.
- B. Core and Frame:
 - 1. Hollow core with MDF frame.
 - a. Thickness: 1-3/8 inch (35.1 mm).
- C. Hardware:
 - 1. Prep Door for Owner supplied hardware.
- D. Finish: Preprimed.

PART 3 EXECUTION

3.1 GENERAL

- A. Install doors in accordance with manufacturer's installation guidelines and recommendations.

3.2 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Inspect door prior to installation.
- C. Inspect rough opening for compliance with door manufacturer recommendations. Verify rough opening conditions are within recommended tolerances.

3.3 PREPARATION

- A. Prepare door for installation in accordance with manufacturer's recommendations.
- B. Trim bottom of jamb sides to achieve desired distance between door bottom and finished floor height.

3.4 PASSAGE DOOR INSTALLATION

- A. Place door unit into opening and level hinge side of jamb. Use shims fastened through jamb and stop to level and temporarily secure in place.
- B. Level latch side of jamb. Use shims fastened through jamb and stop to level and temporarily secure in place.
- C. Verify spacing between jamb and door is uniform on all sides. Adjust as necessary.
- D. Shim top of jamb in center of opening and fasten with nail.
- E. Re-check for square, level and even spacing around door. Nail securely in place through stop, jamb, shims and into studs every 12 inches.
- F. Set nails.
- G. Install trim under provisions of 06 20 00 on both sides using nails every 12 to 16 inches.

3.5 BIFOLD DOOR INSTALLATION

- A. Attach door hardware to door.
- B. Attach jamb hardware.
 - 1. Fasten overhead track in center of finished opening by inserting screws through pre-drilled holes.
 - 2. Attach jamb brackets flush to finished floor in line with overhead track.
- C. Install door assemblies.
 - 1. Place pivot pin in hole at top corner bracket and place guide wheel in track.
 - 2. Lift door assembly and drop bottom pin into bottom bracket hole.
- D. Check positioning and operation. Adjust hardware if necessary.

3.6 BY-PASS DOOR INSTALLATION

- A. Attach door hardware to door, track to finished opening, and door assemblies to track in accordance with track manufacturer instructions.
- B. Check positioning and operation. Adjust hardware if necessary.

3.7 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.8 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- B. Adjust doors for smooth and balanced door movement and positive latching of locking hardware.

END OF SECTION

SECTION 08 16 13

FIBERGLASS (ENTRY) DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fiberglass Entry Doors
 - 2. Frames for pre-hung swinging doors.

- B. Related Sections:
 - 1. Section 06 10 00 – Rough Carpentry: Framed openings for doors.
 - 2. Section 06 20 00 – Finish Carpentry: Standing and Running trim for Doors.
 - 3. Section 08 71 00 – Door Hardware.
 - 4. Section 09 00 00 – Painting.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM E90 – Laboratory measurement of Airborne Sound Transmission of Building Partitions and Elements.
 - 2. ASTM E 283 – Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Difference Across the Specimen.
 - 3. ASTM E 330 – Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference. ASTM E 331 – Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 - 4. ASTM E 413 – Classification for Rating Sound Insulation (STC). ASTM E 547 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference
 - 5. ASTM E 1300 – Standard Practice for Determining Load Resistance of Glass in Buildings.
 - 6. ASTM E1332 – Standard Classification for Rating Outdoor – Indoor Sound Attenuation.
 - 7. ASTM E 1886 – Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missiles and Exposed to Cyclic Pressure Differentials.
 - 8. ASTM E 1996 – Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
 - 9. ASTM E 2235 – Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods.

- B. Environmental Protection Agency and Department of Energy:
 - 1. Energy Star Program Requirements Product Specification for Residential Windows, Doors, and Skylights.

- C. Code of Federal Regulations:
 - 1. CFR 1201 Part 2 – Safety Standard for Architectural Glazing Materials.

- D. National Fenestration Rating Council:
 - 1. NFRC 100 – Procedure for Determining Fenestration Product U-Factors.
 - 2. NFRC 200 – Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance (VT) at Normal Incidence.
 - 3. NFRC 400 – Procedure for Determining Fenestration Product Air Leakage.
- E. National Fire Protection Association:
 - 1. NFPA 252 – Standard Methods of Fire Tests of Door Assemblies.
- F. Underwriters Laboratory:
 - 1. UL 10B – Standard for Fire Testing Door Assemblies.
 - 2. UL 10C – Standard for Positive Pressure Fire Tests of Door Assemblies.

1.3 PERFORMANCE REQUIREMENTS

- A. Doors shall have a structural design pressure rating of DP [____].
- B. Doors shall have an impact design pressure rating of DP [____].
- C. Door Unit Air Leakage, NFRC 400, 1.57 psf (25 mph): 0.50 cfm per square foot of frame or less.
- D. Door Unit Water Penetration: No water penetration through door unit when tested in accordance with ASTM E 331 or ASTM E 547 with water applied at rate of 5 gallons per hour per square foot at 0 psf.
- E. Doors shall have a minimum STC rating of [____] or a minimum OITC rating of [____].
- F. Doors shall have a positive pressure certified fire door rating of [____] minutes.
- G. Doors shall have a minimum/maximum U-Value and a minimum/maximum SHGC of:
 - 1. 1/3 Lite Doors: U-Value of 0.21 and minimum/maximum SHGC of 0.09.
 - 2. 1/2 Lite Doors: U-Value of 0.21 and minimum/maximum SHGC of 0.09.
 - 3. 2/3 Lite Doors: U-Value of 0.26 and minimum/maximum SHGC of 0.15.
- H. Doors shall qualify for Energy Star Rating.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Submit manufacturer's shop drawings, indicating dimensions, construction, component connections, anchorage methods and locations, accessories, hardware locations, and installation details.
- C. Product Data: Submit door manufacturer current product literature, including installation instructions.
- D. Samples: Submit full-size or partial full-size verification sample of door illustrating glazing system, quality of construction, texture, and color of finish.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall have successful experience in producing the type of product required for project applications equivalent to the requirements for this project.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver materials to site undamaged with labels clearly identifying manufacturer, product name, and installation instructions.
- C. Store materials in an upright position, off ground, under cover, and protected from weather, direct sunlight, and construction activities.
- D. Protect materials and finish during handling and installation to prevent damage.

1.7 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Fiberglass Entry Doors, frames, and non-rot resistant mullions and brickmould) used in commercial and multiresidential projects will be free from material and workmanship defects for a period of three years subject to certain limitations and restrictions.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Acceptable Manufacturer: Therma-Tru Corp.; 1750 Indian Wood Circle, Maumee, OH 43537. Telephone: (419) 891-7400. www.thermatru.com. Contact: Rod Clark: (458) 206-8532; rclark@thermatru.com.
- B. Substitutions: Not permitted.
- C. Basis of Design: ThermaTru Classic-Craft Canvas Collection.

2.2 FIBERGLASS ENTRY DOORS

- A. Classic -Craft®
- B. Construction:
 - 1. 3/32" minimum thickness proprietary fiberglass reinforced thermoset composite, smooth surface. Door edges are machinable kiln-dried hardwood, flush and square with door faces, lock edge reinforced with full-length integrated 3-1/2-inch wide engineered lumber core. Door bottom edge is moisture- and decay-resistant composite. Core is foamed-in-place polyurethane, with a minimum density of 1.9 pcf.
- C. Door Style:
 - 1. Canvas Collection: Style as indicated on Drawings.

- D. Frames:
 - 1. Milled from 5/4 kiln-dried material with profiled 1/2" stop and 6 degree sill gain prep.
 - 2. Jamb Width: Standard 4 9/16"
 - 3. Rot Resistant – frames sourced through Therma-Tru..
- E. Sills:
 - 1. Public Accessible Sill.
 - 2. Finish: Satin nickel.
- F. Hinges: Steel, ball bearing 4 x 4 x 0.098 inches finished to match hardware, plated screws to match.
 - 1. Finish: US26, polished chrome.
- G. Locking Hardware:
 - 1. As specified in Section 08 71 00.
- H. Glazing:
 - 1. Therma-Tru factory glazed with double-pane construction.
 - 2. Low-E tempered glass.

PART 3 EXECUTION

3.1 GENERAL

- A. Install doors in accordance with manufacturer's installation guidelines and recommendations.

3.2 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Examine areas to receive doors. Notify Architect in writing any unacceptable conditions that would adversely affect installation or subsequent performance of the product. Do not proceed with installation until unsatisfactory conditions are corrected.

3.3 INSTALLATION

- A. Install fiberglass doors in full compliance with Therma-Tru® written instructions and approved shop drawings.
- B. Maintain alignment and compatibility with adjacent work.

3.4 FINISHING

- A. Finish under provisions of Section 09 90 00 in compliance with Therma-Tru® written recommendations. Guidance for proper finishing is available at www.thermatru.com – "Recommendations for Proper Finishing and Painting or Staining."

3.5 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.

- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.6 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- B. Adjust doors for smooth and balanced door movement and positive latching of locking hardware.

END OF SECTION

SECTION 08 52 16

PLASTIC-CLAD WOOD WINDOWS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Plastic clad wood windows.
 - 2. Factory glazing.
 - 3. Operating hardware.
 - 4. Insect screens.

- B. Related Requirements:
 - 1. Section 06 20 00 – Finish Carpentry: Jamb extensions and interior trim.
 - 2. Section 07 21 16 – Blanket Insulation: Insulation for gap between window and perimeter construction.
 - 3. Section 09 90 00 - Painting and Coating: Site finishing wood surfaces.

1.2 REFERENCE STANDARDS

- A. American Architectural Manufacturers Association:
 - 1. AAMA 101 - Voluntary Performance Specification for Windows, Skylights and Glass Doors.
 - 2. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

- B. American Society of Civil Engineers:
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

- C. ASTM International:
 - 1. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 - 2. ASTM D3656 - Standard Specification for Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns.
 - 3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 4. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - 5. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference.
 - 6. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference.
 - 7. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.
 - 8. ASTM E1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
 - 9. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

- D. Glass Association of North America:
 - 1. GANA - FGMA Sealant Manual.

- E. National Fenestration Rating Council Incorporated:
 - 1. NFRC 100 - Procedures for Determining Fenestration Product U-Factors.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit component dimensions, anchorage and fasteners, glass, internal drainage details and for window hardware and accessories.
- C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work; and installation requirements.
- D. Samples:
 - 1. Submit cladding and hardware color samples for selection.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- F. Manufacturer's Instructions: Submit special procedures and perimeter conditions requiring special attention.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with the following:
 - 1. Plastic Clad Wood Windows: Fabricate and label window assemblies in accordance with AAMA 101 for types of windows required.
 - 2. Insulated Glass: Fabricate insulated glass units in accordance with GANA.
- B. Surface Burning Characteristics:
 - 1. Foam Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing wood windows with minimum three years documented experience.
- B. Installer: Company specializing in performing installation of wood windows with minimum three years documented experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Protect factory finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.7 AMBIENT CONDITIONS

- A. Section 01 50 00 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.
- 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.

1.8 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish five year manufacturer's warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same.
- C. Warranty:
 - 1. Include coverage for degradation of color finish.
 - 2. Include coverage for delamination or separation of finish cladding from window member.

PART 2 PRODUCTS

2.1 WOOD WINDOWS

- A. Manufacturer and Product List:
 - 1. Andersen Commercial; 400 series as basis of design.
 - 2. Marvin Windows & Doors.
 - 3. Pella Corp.
- B. Product Description: Commercial quality wood windows, site finished plastic clad finish, sash, glass and glazing, operating hardware, and insect screen for operable windows.
- C. Window Configuration: Tilt-wash double hung sash.
- D. Performance / Design Criteria:
 - 1. Primary Performance Requirements: AAMA 101 Designation LC-PG50 or better.

2.2 COMPONENTS

- A. Wood: Clear Pine species, clear preservative treated, of type suitable for transparent interior finish.
- B. Plastic Cladding (Exterior Surface): Extruded PVC, low sheen surface, factory fit to profile of exterior exposed surfaces; ASTM D1785 PVC, minimum 35 mils thick, with integral surface applied ultra-violet degradation resistance; welded corners.
- C. Frames: Seamless one piece, preformed rigid vinyl frame covered secured to the exterior of the frame with nailing flange. Clear pine interior stops.
- D. Glazing: High-Performance Low E.
- E. Weather-stripping: Flexible bulb or black PVC closed cell foam.
- F. Screen: Perma-Clean insect screen.
- G. Hardware: Andersen Classic Collection with compact operator handle.
- H. Jamb extensions and interior trim: As specified in section 06 20 00.

2.3 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 09 90 00.
- C. Exposed Hardware: Baked enamel color as selected.

2.4 ACCESSORIES

- A. Anchors: Hot dip galvanized steel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this section, and opening dimensions and clearances are as indicated on shop drawings.

3.2 INSTALLATION

- A. Install windows in accordance with manufacturer's recommendations and approved shop drawings to achieve weathertight and freely operating installation.
- B. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- C. Secure assembly to framed openings, plumb and square, without distortion.
- D. Place insulation in shim spaces around unit perimeter to maintain continuity of building thermal barrier.
- E. Install sills, stools, and aprons.
- F. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- G. Coordinate attachment and seal of perimeter air and vapor retarder materials.
- H. Install operating hardware.

3.3 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation from Level and from Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.4 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- B. Adjust hardware for smooth operation and secure weathertight closure.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Remove protective material from factory finished surfaces.
- C. Remove labels and visible markings.
- D. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Furnish hardware required to complete the work as shown on the drawings and as specified herein;
 - 2. Furnish trim attachments and fastenings, specified or otherwise required, for proper and complete installation.
 - 3. Deliver to the job site those items of finish hardware scheduled to be installed at the job site;
 - a. Butt Hinges
 - b. Lock cylinders and keys
 - c. Lock and latch sets
 - d. Door trim
 - e. Seals

- B. Related Sections:
 - 1. Section 08 12 13 - Custom Steel Frames.
 - 2. Section 08 13 13 – Flush Wood Doors.
 - 3. Section 08 16 00 – Composite (Interior) Doors.
 - 4. Section 08 16 13 – Fiberglass Entry Doors.

1.2 DEFINITIONS

- A. "Finish Hardware": Items required for swinging doors, except special types of unique and non-matching hardware specified under door and frame Sections of these Specifications.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

- B. Product data:
 - 1. Submit "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.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with the following requirements:
 1. ANSI A156 series.
 2. NFPA 80.
 3. UL 305.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Package hardware items individually with necessary fasteners, instructions, and installation templates, when necessary; label and identify each package with door opening code to match hardware schedule.
 1. Include instructions, templates, and fasteners needed for installation.

1.7 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate Owner's keying requirements during course of Work.

PART 2 PRODUCTS

2.1 GENERAL

- A. Product designations:
 1. Provide the product designated under this Section, or equal.
- B. 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.
- C. Hand of door: Drawings show direction of slide, swing ("hand") of door leaves.
- D. 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.

2.3 ACCESSORIES

- A. 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.
- B. 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.

2.4 MANUFACTURED UNITS

- A. Hardware finishes:
 - 1. Materials and Finishes Standard: Comply with ANSI A156.18 (BHMA 1301). Finish designations used in schedules are listed, therein.
 - 2. Match the color and texture of hardware items to manufacturer's standard finish for the latchset, lockset, or push-pull unit.
 - 3. 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.

2.5 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. Base material: Manufacturer's standard high-carbon steel, brass, or bronze.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify doors and frames are ready to receive door hardware and dimensions are as indicated on shop drawings.
- C. 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 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.

3.3 ADJUSTING AND CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
- B. 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.
- C. Clean adjacent surfaces soiled by hardware installation.

3.4 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
- B. Do not permit adjacent work to damage hardware or hardware finish.

3.5 HARDWARE SETS

Hardware Set 1– Interconnected Entry Lock [Lock / Unlock]

1 set	Pre-hung door system, hinges by pre-hung supplier	26D	----
1 ea.	Interconnected Entry Lock CL 116 BSN	26D	PDQ
1 ea.	Flip Guard 1606	26D	Don Jo
1 ea.	Wall Stop 1509	26D	Don Jo
1 set	Pre-hung door system; threshold, weatherstrip, sweep by pre-hung supplier		

Hardware Set 2 –Passage Set [Always Unlocked]

1 set	Pre-hung door system, hinges by pre-hung supplier	26D	----
1 ea.	Passage Set SD 126 BSN	26D	PDQ
1 ea.	Wall Stop 1509 or 2 ea. Hinge Pin Stop 1507 -as required	26D	Don Jo

Hardware Set 3 –Privacy Set [Lock / Unlock]

1 set	Pre-hung door system, hinges by pre-hung supplier	26D	----
1 ea.	Privacy Set SD 176 BSN	26D	PDQ
1 ea.	Wall Stop 1509 or 2 ea. Hinge Pin Stop 1507 -as required	26D	Don Jo

Hardware Set 4 –Bypass door w/ flush pulls [Always Unlocked]

1 set	2 Door Bypass C-500 2 DR Kit (size as required)	----	KN Crowder
1 set	Fascia C-130 -length as required	AL	KN Crowder
2 ea.	Flush pulls C-72	626	KN Crowder

Note: Door panels by door supplier. Include all necessary track, Hangers, guides, and plates for a complete bypass door system. Molding and trim by other.

Hardware Set 5 – 2 door bi-fold [Always Unlocked]

1 set	2 Door Bi-Fold CF-115 4DR Kit (width as scheduled)	----	KN Crowder
1 set	Fascia C-130 -length as required	AL	KN Crowder
2 ea.	Pull 37 x 1 Mount	32D	Don Jo

Note: Folding door Panels by door supplier. Include all necessary track, Hangers, guides, joining hinges and plates for a complete 2 door bi-fold system.
- Door panels and joining hinges by door supplier.

Hardware Set 6 – 4 door bi-fold [Always Unlocked]

1 set	4 Door Bi-Fold CF-115 4DR Kit (width as scheduled)	----	KN Crowder
1 set	Fascia C-130 -length as required	AL	KN Crowder
2 ea.	Pull 37 x 1 Mount	32D	Don Jo

Note: Folding door Panels by door supplier. Include all necessary track, Hangers, guides, joining hinges and plates for a complete 4 door bi-fold system.
- Door panels, frame and joining hinges by door supplier

Hardware Set 7 – Storeroom Lock [Always Locked]

3 ea.	Hinges 35SSBB 4545 NRP	32D	PDQ
1 ea.	Storeroom Lock GT 115 BSN	26D	PDQ
1 ea.	Overhead Stop 3324	32D	Don Jo
1 ea.	Threshold S425A	AL	Reese
1 ea.	Sweep 967C	AL	Reese
1 set	Weatherstrip 815A	AL	Reese

END OF SECTION

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Gypsum board and joint treatment.
 - 2. Textured finishes.
- B. Related Requirements:
 - 1. Section 03 11 19 – Insulating Concrete Forms: Building envelop construction.
 - 2. Section 06 10 00 - Rough Carpentry: Building wood framing system.

1.2 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - 2. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
 - 3. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
 - 4. ASTM C1002 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases.
 - 5. ASTM C1047 – Standard Specifications for Accessories for Gypsum Wallboard.
 - 6. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
 - 7. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- B. Gypsum Association:
 - 1. GA 214 - Recommended Levels of Gypsum Board Finish.
 - 2. GA 216 - Application and Finishing of Gypsum Board.
 - 3. GA 600 - Fire Resistance Design Manual Sound Control.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data on gypsum board and decorative finish.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C840, GA-214, GA-216 and GA-600 as applicable.
- B. Fire Rated Wall, Floor, and Roof Construction: Rating as indicated on Drawings.
 - 1. Tested Rating: Determined in accordance with ASTM E119.
 - 2. Prescriptive Ratings: As indicated in Drawings in accordance with 2015 Michigan Building Code.

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 with minimum three years documented experience.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

- A. Manufacturer List:
 - 1. Georgia-Pacific Corporation.
 - 2. National Gypsum Co.
 - 3. United States Gypsum Co.
 - 4. Gold Bond Building Products
 - 5. Or equal

2.2 MATERIALS

- A. Gypsum Board Materials: ASTM C1396/C1396M; Type X.
 - 1. Standard Gypsum Board: Maximum available length in place; ends square cut, tapered edges, thickness as indicated in Drawings.
 - 2. Moisture Resistant Gypsum Board: Maximum available length in place; ends square cut, tapered edges, Thickness as indicated in Drawings.
- B. Gypsum Board Accessories: ASTM C1047; metal; corner beads, edge trim, and expansion joints.
 - 1. Metal Accessories: Galvanized steel.
 - 2. Edge Trim: Type LC, L, and U bead as required.
- C. Joint Materials: ASTM C475/C475M; reinforcing tape, joint compound, and water.
- D. Textured Finish Materials: Latex based texturing material, white popcorn ceiling texture, QT Medium Poly Ceiling Spray Texture as manufactured by Sheetrock, or equal.
- E. Adhesive: ASTM C557.
- F. Gypsum Board Screws: ASTM C1002; length to suit application.
 - 1. Screws for Wood Framing: Type W.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.

3.2 INSTALLATION

- A. Gypsum Board Installation:
1. Install gypsum board in accordance with ASTM C840, GA-216, and GA-600 as applicable.
 2. Erect single layer standard gypsum board in horizontal, with ends and edges occurring over firm bearing.
 3. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.
 4. Use screws when fastening gypsum board to ICF directly.
 5. Use adhesive and screws when fastening gypsum board to wood framing.
 6. Double Layer Applications: Secure second layer to first with fasteners. Apply adhesive. To first layer.
 7. Place second layer parallel to first layer. Offset joints of second layer from joints of first layer.
 8. Erect exterior gypsum soffit board perpendicular to supports, with staggered end joints over supports.
 9. Place control joints consistent with lines of building spaces as recommended or otherwise required to prevent cracking in finished surfaces.
 10. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.
- B. Joint Treatment:
1. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 2. Feather coats on to adjoining surfaces so that camber is maximum 1/32 inch.
 3. Taping, filling, and sanding is required at all exposed to view surfaces
 4. Taping and filling is required at concealed surfaces.
- C. Texture Finish:
1. Apply texture to substrate using hopper and manufacturer's recommended spray equipment to produce popcorn spatter texture.

3.3 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation of Finished Gypsum Board Surface from Flat Surface: 1/8 inch in 10 feet.

3.4 SCHEDULE

- A. Gypsum Board:
1. Gypsum Board in bathrooms and on walls adjacent to kitchen counters; moisture resistant gypsum board.
 2. Gypsum Board in all other locations; Standard gypsum board.
- B. Finishes in accordance with GA-214 Level:
1. Level 1: Above finished ceilings concealed from view.
 2. Level 5: Exposed to view walls schedule to be painted.
 3. Level 4: Exposed to view ceilings scheduled to be painted.
 4. Level 3: Exposed to view ceilings schedule to receive texture finish.
 5. Level 3: Exposed to view walls and ceiling in Mechanical Room.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Section includes resilient plank flooring.
- B. Related Sections
 - 1. Section 0 62 00 – Finish Carpentry: Wall base.
 - 2. Section 07 90 00 – Joint Protection: Sealants required in connection with flooring installation.

1.2 PRICE AND PAYMENT PROCEDURES

- A. Flooring Allowance: Allowance includes furnishing rigid core vinyl flooring material. Installation and accessory materials are included in this section and is part of Contract Sum/Price. Refer to Section 12 00 00 for basis of allowance cost.

1.3 REFERENCES

- A. ASTM International:
 - 1. ASTM F3261 - Standard Specification for Resilient Flooring in Modular Format with Rigid Polymeric Core.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Samples:
 - 1. Submit manufacturer's complete set of color samples for initial selection.
 - 2. Submit samples illustrating color and pattern for each resilient flooring product specified.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.6 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 three years documented experience.

1.7 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Provide manufacturers 15 year commercial warranty.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Rigid Core Vinyl Flooring Material Allowance: Include \$5.00 per square foot for the purchase of rigid core vinyl flooring in the bid. Owner will select product for purchase by the Contractor.
- B. Manufacturers:
 - 1. Armstrong; Przym as basis of design.
 - 2. Mannington; Adura Max
 - 3. Mohawk; Solidtech
 - 4. Shaw; Floorte
- C. Rigid Core Vinyl Plank: ASTM F3261, Class I, Type B, Grade 1, Backing Class B
 - 1. Size: 6.6 x 47.56 inch.
 - 2. Thickness: 0.26 inch.
 - 3. Pattern: Wood plank.

2.2 ACCESSORIES

- A. Transition Strips: Provide manufactures vinyl transitions strips consisting of a metal track and tee shaped resilient insert matching the pattern, color and texture of the selected flooring.
- B. Sealant: As recommended by manufacturer and in accordance with Section 07 90 00.
- C. Vapor Retarder: 6 mil Polyethylene sheet.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify concrete floors are dry to maximum moisture content as recommended by manufacturer, and exhibit negative alkalinity, carbonization, and dusting.
- C. Verify floor and lower wall surfaces are free of substances capable of impairing adhesion of new adhesive and finish materials.

3.2 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- B. Prohibit traffic until filler is cured.
- C. Clean substrate.

3.3 INSTALLATION

- A. Install vapor retarder over concrete substrates in accordance with manufactures instruction.
- B. Install transition strips at changes to dissimilar flooring.
- C. Install flooring in strict conformance with manufactures instructions and recommendations.
- D. Lay flooring with joints and seams parallel to long dimension of unit (as viewed from entry).
- E. Scribe flooring to walls, cabinets, and other appurtenances to produce tight joints.
- F. Extend flooring through door openings.
- G. Fill expansion gap with silicone sealant at full perimeter in bathroom installations.

3.4 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Clean flooring in accordance with manufacturers instructions.

END OF SECTION

SECTION 09 68 16

SHEET CARPETING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sheet carpet, stretched-in with cushion underlay.
 - 2. Accessories.
- B. Related Sections:
 - 1. Section 06 20 00 – Finish Carpentry: Wall base.

1.2 PRICE AND PAYMENT PROCEDURES

- A. Sheet Carpet Allowance: Allowance includes furnishing sheet carpet material. Installation and accessory materials are included in this section and is part of Contract Sum/Price. Refer to Section 12 00 00 for basis of allowance cost.

1.3 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM D2859 - Standard Specification for Ignition Characteristics of Finished Textile Floor Covering Materials.
- B. Carpet and Rug Institute:
 - 1. CRI Carpet Installation Standard - Standard for Installation of Commercial Carpet.
 - 2. CRI Model Specifications for Commercial Carpets.
- C. Consumer Products Safety Commission:
 - 1. CPSC 16 CFR 1630 - Standard for the Surface Flammability of Carpets and Rugs.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Shop Drawings: Indicate seaming plan, method of joining seams, direction of carpet pile and pattern, location of edge moldings and edge bindings.
 - 1. Submit samples of edge strips and base material for each color specified.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.6 QUALITY ASSURANCE

- A. Surface Burning Characteristics:
 - 1. Floor Finishes: Comply with one of the following:
 - a. Class I, minimum 0.45 watts/sq cm when tested in accordance with NFPA 253.
 - b. CPSC 16 CFR 1630 and ASTM D 2859.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installation must be performed by a firm with not less than five (5) years of experience in installation of commercial carpet, by methods similar to those required for this project.
 - 1. FCIB or IFCI certified carpet installers.
- C. Installation must be performed by an installer that is pre-approved in writing by the manufacturer. The agreement between the manufacturer and the installation company must specifically address all installation procedures and materials in order to coordinate with warranties offered by the manufacturer.

1.8 AMBIENT CONDITIONS

- A. Section 01 50 00 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.
- B. Store materials in area of installation for 48 hours prior to installation.
- C. Maintain minimum 70 degrees F ambient temperature 3 days prior to, during and 24 hours after installation.
- D. Ventilate installation area during installation and for 3 days after installation.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Carpeting Material Allowance: Include \$18.00 per square yard for the purchase of carpet in the bid. Owner will select carpeting for purchase by the Contractor.

2.2 ACCESSORIES

- A. Cushion: Sponge rubber:
 - 1. Nominal Thickness: 3/8 inch.
 - 2. Density: 5 lb/cu ft.

- B. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.
- C. Floor Primer: Manufacturer's approved floor primer applied to all areas that are to receive carpeting.
- D. Seam Adhesive: Recommended by manufacturer.
- E. Contact Adhesive: Recommended by manufacturer for installation of carpeting.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that substrate surfaces are smooth and flat with maximum variation of 1/8" inch in 10' ft. and are ready to receive work. Correct any deviations in substrate to the satisfaction of the Owner/Architect.
- C. Verify concrete floors are ready for sheet carpet installation by testing for moisture emission rate and alkalinity. Obtain instructions when test results are not within specified limits.
 - 1. Moisture emission rate: Not greater than 3 lb per 1000 sq ft per 24 hours when tested using calcium chloride moisture test kit for 72 hours.
 - 2. Alkalinity: pH range of 5-9.

3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.

3.3 INSTALLATION - CARPET

- A. Install sheet carpet in accordance with CRI Carpet Installation Standard and manufacturers instructions.
- B. Installation of carpet must proceed in strict accordance with manufacturer's printed installation instructions. This includes the use of adhesives and seam sealers supplied by the manufacturer.
- C. Installation On Stairs - Stretched Tackless Method: CRI Carpet Installation Standard Section 17.
 - 1. Install sheet carpet using waterfall technique, returning sheet carpet over nosing to bottom stair riser.
 - 2. Install tackless strips at back of treads, with pins facing riser, and at bottom of riser, with pins facing tread.

3. Install cushion on stair treads and lap over nosing.
4. Install sheet carpet on stairs with run of pile in opposite direction of anticipated traffic to avoid peaking of backing at nosings.
5. Stretch sheet carpet over stair treads, full width in one piece.

D. Trim sheet carpet neatly at walls and around interruptions.

3.4 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- C. Clean and vacuum sheet carpet surfaces.

3.5 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Do not permit traffic over unprotected floor surface.
- C. Cover carpeting in traffic areas with protective non-staining building paper. Do not use plastic sheeting.

END OF SECTION

SECTION 09 90 00
PAINTING AND COATING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and field application of paints, stains, varnishes, and other coatings.
- B. Related Sections:
 - 1. Section 06 20 00 – Finish Carpentry: Standing and running trim requiring field finish.
 - 2. Section 06 40 00 – PVC Column Covers: Column Covers requiring field finish.
 - 3. Section 08 12 13 – Hollow Metal Frames: Metal frames requiring field finish.
 - 4. Section 08 13 13 – Hollow Metal Doors: Metal doors requiring field finish.
 - 5. Section 08 16 00 – Composite (Interior) Doors: Interior doors and frames requiring field finish.
 - 6. Section 08 16 13 – Fiberglass (Entry) Doors: Entry Doors and frames requiring field finish.
 - 7. Section 08 52 16 – Plastic-Clad Wood Windows: Wood windows requiring field finish.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
 - 2. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.
 - 3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. SSPC: The Society for Protective Coatings:
 - 1. SSPC - Steel Structures Painting Manual.

1.3 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on finishing products.
- C. Samples:
 - 1. Submit paper chip samples illustrating range of colors available for each surface finishing product scheduled.
 - 2. Submit transparent finish samples, illustrating selected colors for each color and system selected on wood species being installed.
- D. Manufacturer's Installation Instructions: Submit special surface preparation procedures, substrate conditions requiring special attention.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.6 QUALITY ASSURANCE

- A. Surface Burning Characteristics:
 - 1. Fire Retardant Finishes: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Applicator: Company specializing in performing work of this section with minimum three years documented experience and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- C. Container Label: 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. Paint Materials: Store at minimum ambient temperature of 45 degrees F and maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.
- C. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by 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 Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
- F. Provide lighting level of 80 ft candle measured mid-height at substrate surface.

1.10 SEQUENCING

- A. Sequence application to the following:
 - 1. Do not apply finish coats until paintable sealant is applied.
 - 2. Back prime wood trim before installation of trim.

1.11 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for paints and coatings.

1.12 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Supply 1 gallon of each color, type, and surface texture; store where directed.
- C. Label each container with color, type, and texture, in addition to manufacturer's label.

PART 2 PRODUCTS

2.1 PAINTS AND COATINGS

- A. Manufacturers: Paint
 - 1. Glidden Coatings and Resins
 - 2. Benjamin Moore and Company
 - 3. Sherwin Williams Company
 - 4. Valspar Corporation
 - 5. Devoe Paint Co.
 - 6. Fuller-O'Brien.
 - 7. PPG Architectural Finishes.

2.2 COMPONENTS

- A. Coatings: Ready mixed, except field catalyzed coatings. Prepare coatings:
 - 1. To soft paste consistency, capable of being readily and uniformly dispersed to homogeneous coating.
 - 2. For good flow and brushing properties.
 - 3. 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 finishes specified; 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: Exterior Enamel.
 - a. 1st Coat; (Primer):
 - 1) As recommended by finish manufacturer by substrate being finished.
 - b. 2nd Coat and 3rd Coat:
 - 1) Gloss Exterior Enamel.
 2. Apply to the following scheduled exterior surfaces:
 - a. Hollow metal doors and frames.
 - b. Fiberglass (Entry) Doors.
 - c. PVC Column Covers
 - d. Gas piping and meter.
 - e. Bollards and guard posts not factory finished.
- B. Interior Paint Systems IPS-1: Interior Latex.
1. Latex Base, Satin Finish:
 - a. 1st Coat: (Primer):
 - 1) As recommended by finish manufacturer by substrate being finished.
 - b. 2nd Coat and 3rd Coat: Latex base emulsion, satin sheen. Color as selected by Architect.
 2. Apply to the following interior surfaces as scheduled:
 - a. Gypsum board walls and ceilings except as otherwise noted or scheduled to be unfinished.
 - b. Other surfaces and rooms as scheduled on the Room Finish Schedule.
- C. Interior Paint System IPS-2: Interior Latex.
1. Latex Base, Semi-gloss Finish:
 - a. 1st Coat: (Primer):
 - 1) As recommended by finish manufacturer by substrate being finished.
 - b. 2nd Coat and 3rd Coat: Latex base emulsion, semi-gloss sheen. Color as selected by Architect.
 2. Apply to the following interior surfaces as scheduled:
 - a. Composite interior doors and frames.
 - b. Standing and running wood trim.
- D. Interior Paint System IPS-3: Interior Enamel.
1. Semi-Gloss Enamel:
 - a. 1st Coat: (Primer)
 - 1) As recommended by finish manufacturer by substrate being finished.
 - b. 2nd Coat and 3rd Coat: Interior Enamel, Semi-Gloss.
 2. Apply to the following interior surfaces:
 - a. Metal handrails.
 - b. Other interior metal items not field finished.
 - c. Exposed to view mechanical and electrical items specified to be field finished.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify surfaces and substrate conditions are ready to receive Work as instructed by product manufacturer.

- C. Examine surfaces scheduled to be finished prior to commencement of work. Report conditions capable of affecting proper application.
- D. Test shop applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using 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. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.2 PREPARATION

- A. Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- B. Surfaces: Correct defects and clean surfaces capable of affecting work of this section. Remove or repair existing coatings exhibiting surface defects.
- C. Marks: Seal with shellac those which may bleed through surface finishes.
- D. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.
- E. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.
- F. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- G. 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.
- H. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by [hand] [power tool] wire brushing or sandblasting; clean by washing with solvent. Apply treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.
- I. 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.
- J. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

3.3 APPLICATION

- A. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- B. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless specified otherwise.
- C. Sand wood and metal surfaces lightly between coats to achieve required finish.

- D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- E. Where clear finishes are required, tint fillers to match wood. Work fillers into grain before set. Wipe excess from surface.
- F. Prime concealed surfaces of interior and exterior woodwork with primer paint.
- G. Prime concealed surfaces of interior wood surfaces scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with thinner.
- H. Finishing Mechanical And Electrical Equipment:
 - 1. Paint exterior exposed to view gas piping.
 - 2. Paint interior surfaces of air ducts visible through grilles and louvers with one coat of flat black paint to visible surfaces. Paint dampers exposed behind louvers, grilles, to match face panels.
 - 3. Paint exterior exposed to view conduit and electrical equipment.
 - 4. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Collect waste material which may constitute fire hazard, place in closed metal containers, and remove daily from site.

END OF SECTION

SECTION 10 14 19

SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes exterior dimensional letter signage for entry doors.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit Manufactures data describing physical characteristics, finishes, and installation procedures.
- C. Shop Drawings: Indicate letter styles, lettering font, locations, and dimensions.
- D. Samples: Submit sign, full size illustrating type, style, letter font, and colors specified; method of attachment.
- E. Manufacturer's Installation Instructions: Submit installation template and attachment devices.

1.3 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Package signs, labeled in name groups.
- C. Store adhesive attachment tape at ambient room temperatures.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- 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 DIMENSIONAL LETTER SIGNS

- A. Cut Metal Letters; fabricated from brushed stainless steel, as manufactured by ASI
 - 1. Heights: 3 inches.

2. Edges: Square.
3. Character Font: Helvetica.

2.2 ACCESSORIES

- A. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

3.2 INSTALLATION

- A. Install signs after doors are finished,
- B. Center sign on door surface, level.
- C. Position sign centered on rail below immediately below door lite.

3.3 SCHEDULES

- A. Entry Doors Signs:
 1. Building 3: 3A, 3B, 3C, 3D, 3E, 3F, 3G, 3H, 3I, 3J.
 2. Building 4: 4A, 4B, 4C, 4D, 4E, 4F, 4G, 4H.
 3. Building 5: 5A, 5B, 5C, 5D, 5E, 5F, 5G, 5H, 5I, 5J.
 4. Building 6: 6A, 6B, 6C, 6D, 6E, 6F, 6G, 6H, 6I, 6J

END OF SECTION

SECTION 10 28 16
BATH ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes bath accessories.
- B. Related Sections:
 - 1. Section 03 11 19 – Insulating Concrete Forms: placement of concrete to the face of ICF for support and attachment of accessories.
 - 2. Section 06 10 53 – Miscellaneous Rough Carpentry: Framing and blocking for support and attachment of accessories.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A117.1 – Accessible and Usable Buildings and Facilities.
- B. ASTM International:
 - 1. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 3. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - 4. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 5. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 6. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
 - 7. ASTM C1036 - Standard Specification for Flat Glass.
- C. Federal Specification Unit:
 - 1. FS A-A-3002 - Mirrors, Glass.

1.3 DESIGN REQUIREMENTS

- A. Design grab bars, and attachments to resist minimum 250 lb concentrated load applied at any point in any direction as required by applicable code.

1.4 SUBMITTALS

- A. Product Data: Submit data on accessories describing size, finish, details of function, attachment methods.
- B. Manufacturer's Installation Instructions: Submit special procedures, conditions requiring special attention.

1.5 REGULATORY REQUIREMENTS

- A. Toilet accessories shall conform with American w/Disabilities Act requirements and ANSI A117.1 Accessible and Usable Buildings and Facilities requirements. ADA and ANSI A117.1 requirements shall supercede technical specifications of this section.

1.6 QUALITY ASSURANCE

- A. Provide all Products and accessories from a single source.

1.7 COORDINATION

- A. Coordinate the Work with placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2 PRODUCTS

2.1 TOILET AND BATH ACCESSORIES

- A. Manufacturers:
 - 1. Bradley Corp. (Basis of design)
 - 2. American Specialties, Inc.
 - 3. Bobrick.
 - 4. Or equal

2.2 COMPONENTS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Keys: Furnish 2 keys for each accessory to Owner; master key accessories.
- C. Stainless Steel Sheet: ASTM A666 Type 304.
- D. Stainless Steel Tubing: ASTM A269, Type 304 stainless steel.
- E. Galvanized Sheet Steel: ASTM A653/A653M, G90 zinc coating.
- F. Mirror Glass (Type MR-F): ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality Q1 mirror select; type with copper and silver coating, and organic overcoating.
- G. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof.
- H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 TOILET ROOM ACCESSORIES

- A. Toilet Tissue Dispenser (TTD): Surface-mounted single roll toilet tissue dispenser shall be heavy gauge stainless steel with satin finish and hold one standard core toilet tissue roll. Equal to Bradley Model 5084:

- B. Mirror (MIR): 30 x 36 inch frameless mirror shall be of first quality 1/4" float glass, guaranteed for 15 years against silver spoilage. Edges ground and polished smooth. Equal to Bradley Model 747-03036.
- C. Towel Bar (TB): 30 x 3/4 inch square Towel Bar Surface-mounted accessory shall be fabricated of heavy gauge No. 4 satin finish stainless steel. Equal to Bradley Model 9054-3000US.
- D. Medicine Cabinet (MC): Recessed medicine cabinet consisting of mirror and storage cabinet with four shelves shall be fabricated of stainless steel with exposed surfaces in satin finish. Mirrored door with full-length piano hinge. Interior of storage cabinet to have four shelves — three adjustable and one fixed. Adjustable for right or left hand door swing. Equal to Bradley Model 175-10.

2.4 FACTORY FINISHING

- A. Stainless Steel: No. 4 satin brushed, unless otherwise noted.
- B. Galvanizing: ASTM A123/A123M; hot dip galvanize after fabrication.
- C. Galvanizing for Nuts, Bolts and Washers: ASTM A153/A153M.
- D. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.
- E. Back paint components where contact is made with building finishes to prevent electrolysis.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify exact location of accessories for installation.
- B. Verify field measurements are as indicated on product data.
- C. See Section 06 10 00 for installation of blocking and reinforcing plates in walls.

3.2 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. 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.
- C. Mounting Heights and Locations: As required by accessibility regulatory requirements.

END OF SECTION

SECTION 10 57 33
CLOSET AND UTILITY SHELVING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes
 - 1. Steel wire closet and utility shelving and accessories.
- B. Related Sections:
 - 1. Section 06 10 00 – Rough Carpentry: Installation of blocking for support and attachment.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate locations and configurations.
- C. Product Data: Submit manufactures product data describing components.

1.3 COORDINATION

- A. Coordinate with Work of 06 10 00 for installation of wood blocking for support and attachment.

PART 2 PRODUCTS

2.1 CLOSET AND UTILITY SHEVLING

- A. Manufacturers: Closet Maid
- B. Product Description:
 - 1. Closet Shelving: 12 and 16 inch deep steel ventilated wardrobe shelving with integral hanger rod, plastic coated.
 - 2. Pantry Shelving: 12 inch deep steel ventilated shelving, plastic coated.

2.2 COMPONENTS

- A. Shelving: Fabricated from steel wire, plastic coated after fabrication.
- B. Trim, brackets, and supports: Manufactures hangers, supports, braces, and trim to provide a complete and finished installation.

2.3 ACCESSORIES

- A. Fasteners: Screws.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify wall finishes are installed and ready to receive Work of this section.

3.2 PREPARATION

3.3 INSTALLATION

- A. Install shelving in accordance with manufacturers shelving.
- B. Shelving shall be supported at ends, and braced as recommended by manufacturer.

3.4 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation From Indicated Position: 1/4 inch.
- C. Maximum Offset From Indicated Alignment: 1/4 inch.
- D. Maximum Variation from level: 1/8 inch.

3.5 SCHEDULES

- A. Wardrobe closets, entry closets, and storage closets:
 - 1. Buildings 3, 5 & 6 - all units and Building 4 - all units except E and H:
 - a. Install wardrobe shelving at 66 inches above floor as indicated.
 - 2. Building 4 (units E & H):
 - a. Install wardrobe shelving at 66 inches above floor as indicated.
 - b. Install at least one shelf in each closet at 48 inches above floor.
- B. Pantry Shelving:
 - 1. Building 3, 5 & 6 - units A, B, I & J:
 - a. Install pantry shelving at 30, 48, and 66 inches above floor.
 - 2. Building 4 – units A, B G, & H:
 - a. Install pantry shelving at 30, 48, and 66 inches above floor.

END OF SECTION

SECTION 12 35 30
RESIDENTIAL CASEWORK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cabinetry for kitchens and baths.
- B. Related Requirements:
 - 1. Section 06 61 16 – Solid Plastic Fabrications: Counter tops and sinks.
 - 2. Section 07 90 00 – Joint Protection: Sealants for countertop installation.

1.2 PRICE AND PAYMENT PROCEDURES

- A. Cabinetry Allowance: Allowance includes furnishing residential cabinetry. Installation and accessory materials are included in this section and is part of Contract Sum/Price. Refer to Section 12 00 00 for basis of allowance cost.

1.3 REFERENCE STANDARDS

- A. ANSI/KCMA:
 - 1. ANSI KCMA A1611-2017

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data:
 - 1. Submit catalog showing construction details, material specifications and hardware specifications of all items used.
- C. Shop Drawings:
 - 1. Submit shop drawings including:
 - a. Finish, hardware, construction options selection sheet.
 - b. Elevations and plan views.
- D. Samples: Submit color samples for selection.

1.5 CLOSE-OUT SUBMITTALS

- A. Section 01 70 00 - Execution and Close-out Requirements: Requirements for submittals.
- B. Submit manufacturer's warranty.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Delivery and Acceptance Requirements:

1. Deliver casework once painting, and similar requirements have been completed that will not damage casework. This includes ensuring spaces are enclosed and weather tight.
 2. All casework shall be blanket wrapped for protection during shipping.
- C. Storage and Handling:
1. Casework must be protected from dust, dirt and/or other trades.
 2. Countertops are stacked, properly supported and spaced evenly to avoid warping. Large pieces are stacked first on the pallets with shorter pieces stacked on top.

1.7 AMBIENT CONDITIONS

- A. Section 01 50 00 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.
- B. Do not deliver or install the casework until concrete, masonry, and drywall/plaster work is dry; ambient relative humidity is maintained between 25 – 55% prior to delivery and throughout the life of installation; and the temperature is controlled above 55°F.
- C. Casework shall not be stored or installed in non-climate controlled conditions.

PART 2 PRODUCTS

2.1 RESIDENTIAL CASEWORK

- A. Cabinetry Allowance: Include \$150.00 per lineal foot of cabinetry for the purchase of cabinets in the bid. Owner will select product for purchase by the Contractor. Basis of cost shall be lineal footage of base cabinets and lineal footage of wall cabinets installed.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- 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.
- 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 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 using appropriate angles and anchorages.

3.3 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation from Indicated Position: 1/16 inch.
- C. Maximum Offset from Alignment with Abutting Materials: 1/32 inch.

3.4 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean casework.

END OF SECTION

SECTION 21 0001

GENERAL FIRE PROTECTION 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 Fire Suppression Protection systems indicated on the drawings, AND as described in each Section of Division 21 0000 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 21 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 their 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.
- D. The Contractor shall be held responsible for the complete and satisfactory accomplishment of all Work inclusive of whatever miscellaneous material and/or appurtenances are required to perfect the installation, and demonstrate that all fire protection systems will operate satisfactorily under normal operating conditions.

1.02 DRAWINGS

- A. The drawings are diagrammatic and show the general location and arrangement of equipment, piping and related items. They shall be followed as closely as elements of the construction will permit. The Contractor shall design/provide/install all fire protection systems, and associated equipment, complete and include all necessary offsets, fittings, and other components required due to interferences, space constraints, code requirements, etc. as required to provide a complete/functional system.
- B. The general fire protection 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 piping, fittings, 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, plumbing drawings in all matters pertaining to plumbing 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 , coordinate 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 prior to rough-in.
3. Refer to architectural floor plans for locations/heights/types of ceilings, structural elements, fire rated assemblies, etc. Coordinate with architectural plans for details on where fire protection piping will be routed, sprinkler head locations, 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 locations of fire protection items that require access (i.e. isolation valves, test valves, etc.) with reflected ceiling plan. Items located above hard non-accessible ceilings shall have access doors, provided by the Contractor, as required.
6. 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.
7. Verify clearance requirements of all mechanical, electrical and plumbing equipment/systems prior to the installation of any new work. Fire protection equipment, piping, systems, etc. shall not interfere with mechanical, electrical, and plumbing equipment spaces.

1.04 INSPECTION OF SITE AND PROJECT DOCUMENTATION

- A. The Contractor shall visit the site, review all of the construction plans, 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, 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 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 fire protection 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 latest enforceable rules and regulations set forth in local and state codes.
 - 1. Fire Protection systems shall be installed per current jurisdictional codes (i.e. Owner's Building Codes (International Building Codes, confirm Owner's current code to be followed), Michigan Mechanical/Plumbing Codes, current NFPA codes (e.g. NFPA 13/13R, NFPA 101, etc.), and applicable sections of the Michigan Building Code.
- D. In the event that the plans and specifications conflict with any rules, regulations, or codes applying, said rules, regulations and codes shall govern.
- E. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.
- F. Contractor shall prepare any detailed shop drawings and diagrams that are required by the governing authorities (e.g. fire protection plans, fire protection calculations, etc.).

1.08 UTILITIES

- A. The Contractor shall be responsible for coordinating, obtaining service, and advising the Owner/Engineer/utility company(s) as required for the fire protection water service installation.
- B. Rules of local utility companies shall be complied with. The Contractor shall check with the water utility company supplying service to the installation and determine devices including stop valves, etc. which will be required.
- C. 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 proposed to use in the work that are not specifically named in the contract documents must be submitted for review. 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.

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 complete maintenance and operating instructional manuals covering all fire protection 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. Backflow Preventers, Air Compressor, etc.).
- D. Internally subdivide the binder contents with permanent page dividers, organized by specification section and/or major equipment/systems (i.e. Fire Protection Riser Equipment, Fire Protection Sprinklers, 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. Copies of Shop drawings and product data, approved by Architect/Engineer.
 - c. Installation and operational procedures.
 - d. Routine maintenance procedures.
 - e. Trouble shooting procedures.
 - f. Complete parts lists by nomenclature, manufacturer's part number and use.
 - g. Recommended spare parts lists.
 - 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. Warranty Certificates.
 - b. Contractor's and equipment manufacturer's telephone numbers for warranty repair services.
 - c. Copies of approved construction permits.
- F. 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 (AHJ), the Owner's insuring agency, and the Architect and/or Engineer for approval prior to fabrication or installation. Submit proof of approval from the Authority Having Jurisdiction to Architect and/or Engineer.
- D. Unless noted otherwise, submit digital (.pdf format) copies of complete manufacturer's shop drawings for all equipment, valves, 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 fire protection specifications for additional requirements.
 - 1. 21 0500 Common Work Results For Fire Suppression.
 - a. Backflow Preventers.
 - b. Fire Protection System Equipment and Specialties.
 - 2. 21 1300 Fire-Suppression Sprinkler Systems.
 - a. Fire Protection Sprinklers.
 - b. Fire Protection Piping Layouts.
 - c. Fire Protection Calculations.

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 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. 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. Contractor shall submit to the Architect and/or Engineer, record drawings which have been neatly marked to represent as-built conditions for all new fire protection work.
- B. The Contractor shall keep accurate note of all deviations from the construction documents and discrepancies in the underground concealed conditions and other items 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.

3.02 WORK INVOLVING OTHER TRADES

- A. Certain items of equipment or materials specified in the Fire Protection 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 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.

3.04 CHASE, SHAFTS AND RECESSES

- A. Coordinate with structural, architectural and other trades to ensure accurate location and size of chases, shafts and recesses required for fire protection systems/piping.

3.05 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.

3.06 SEALING OF FIRE PROTECTION OPENINGS

- A. Seal the space around pipes and sleeves through walls, floors and ceilings.
- B. Refer to specification 078400-Firestopping.
- C. Provide adequate clearance to allow for proper pipe movement and sealing.
- D. 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.
- E. Sleeves placed in floors shall be flush with the underside of the floor construction and shall have planned, square ends, extending 2 inches above the finished floor, unless otherwise noted or detailed.
- F. 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.
- G. Pipes 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.
- H. Penetrations through fire rated floors and walls shall be firestopped per applicable building code requirements 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.

3.07 CUTTING, CORING AND PATCHING

- A. Refer to General Conditions
- B. The Contractor shall perform all cutting, coring, and patching that may be necessary for the installation of their Work. All cutting, coring, patching and repair work shall be performed by the Contractor through qualified Subcontractors. Contractor shall include full cost of same in his bid.
- C. Secure approval from Architect and/or Structural Engineer, in writing, before cutting, welding/bolting to, or anchoring from any structural building components (i.e. structural steel, load bearing walls, footings/foundations, concrete floors/ceilings, etc.).

3.08 EXCAVATION AND BACKFILLING

- A. Provide all excavation, trenching, tunneling and backfilling required for the fire protection work.
- B. Provide all pumping and/or well pointing required for the fire protection work.
- C. Provide foundations if required to support underground piping.
- D. Refer to Architectural/Structural specification sections for excavation and backfilling details.

3.09 EQUIPMENT FOUNDATIONS AND SUPPORTS

- A. Shall be as required or as shown on plans or specified.
- B. Provide concrete housekeeping pads for all floor mounted fire protection equipment (i.e. backflow preventers, air compressor, pumps, valves, 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. Contractor shall include full cost of concrete housekeeping pads in his bid.
- C. 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 Engineer for same including loads, locations, and methods of attachment.

3.10 EQUIPMENT CONNECTIONS

- A. Make connections to equipment, backflow preventers, 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 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.

3.11 ACCESSIBILITY

- A. All equipment shall be installed so as to be readily accessible for operation, maintenance, and repair, as required by the equipment manufacturer and as subject to the approval of the Engineer.

3.12 ACCESS DOORS

- A. The Contractor, and/or his Subcontractors, shall provide access doors for access to any of their respective fire protection equipment (i.e. valves, controls, 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 trade shall be responsible for removing all debris daily as required to maintain the work area in a neat, orderly condition.

- B. After equipment and systems have been completed and tested, each entire system shall be cleaned and flushed.
- C. Prior to connection of new piping to existing piping systems, all new piping shall be subject to initial flushing, cleaning and final flushing. Provide temporary bypass piping and fittings, temporary valves and strainers, temporary water make-up piping with approved means of backflow prevention, and temporary pumps as needed to perform specified flushing and cleaning requirements.

3.14 PAINTING

- A. All fire protection systems, equipment, piping, 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 Fire Protection 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. Coat polished or plated metal parts with white petroleum jelly immediately after installation.
- D. Protect equipment outlets, pipe openings with temporary plugs or caps.
- E. 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 GENERAL SUPPORT REQUIREMENTS

- A. Each 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, valves, 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.
- C. Where piping, 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.

3.17 PIPING SYSTEMS TESTING

- A. Test backflow prevention at connections between potable water and nonpotable water for proper functioning under normal operating conditions. Provide Owner with one (1) copy of the potable water backflow prevention test report.
- B. 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.
- C. Pressure test fire protection piping in accordance with governing and applicable codes. At minimum, test with water at 200 PSIG - permissible pressure drop shall be 0 PSIG over 2 hour period.

3.18 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..

3.19 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.

3.20 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 fire protection systems is provided by the Architect and/or Engineer, the Contractor shall indicate to the Owner in writing the commencement of the warranty period.

END OF SECTION

SECTION 21 0500

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, fittings, valves, and connections for sprinkler, standpipe and fire hose, and combination sprinkler and standpipe systems.

1.02 REFERENCE STANDARDS

- A. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; The American Society of Mechanical Engineers.
- C. ASME B16.4 - Gray Iron Threaded Fittings; The American Society of Mechanical Engineers.
- D. ASME B16.5 - Pipe Flanges and Flanged Fittings; The American Society of Mechanical Engineers (ANSI/ASME B16.5).
- E. ASME B16.9 - Factory-made Wrought Steel Buttwelding Fittings; The American Society of Mechanical Engineers.
- F. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- G. ASTM A 135/A 135M - Standard Specification for Electric-Resistance Welded Steel Pipe.
- H. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- I. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; American Water Works Association (ANSI/AWWA C105/A21.5).
- J. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association.
- K. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; National Fire Protection Association.
- L. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc..
- M. UL 262 - Gate Valves for Fire-Protection Service; Underwriters Laboratories Inc..
- N. UL 312 - Check Valves for Fire-Protection Service; Underwriters Laboratories Inc..

1.03 SUBMITTALS

- A. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.
- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
- C. Project Record Documents: Record actual locations of components and tag numbering.
- D. Operation and Maintenance Data: Include installation instructions and spare parts lists.
- E. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and shall be specifically identified with the applicable style or series designation.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in

this section with minimum 10 years documented experience.

- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 10 years experience.
- C. Conform to UL and FM requirements.
- D. Valves: Bear UL and FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- E. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.
- F. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single ISO-9001 certified manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
- G. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.
- H. The Fire Protection Contractor shall design and install the fire protection system under direct supervision of a Professional Fire Protection Engineer experienced in design of this type of work and licensed in the PROJECT LOCATION. The fire protection design drawings shall bear the seal/signature/date of the Professional Fire Protection Engineer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers, with labeling in place.
- 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.

PART 2 PRODUCTS

2.01 FIRE PROTECTION SYSTEMS

- A. Sprinkler Systems: Conform work to NFPA 13, or NFPA 13R where allowed by code.
- B. Welding Materials and Procedures: Conform to ASME Code.

2.02 BURIED SPRINKLER AND STANDPIPE PIPING (F)

- A. Steel Pipe: ASTM A 53/A 53M Schedule 40, black, with AWWA C105 polyethylene jacket, or double layer, half-lapped polyethylene tape.
 - 1. Steel Fittings: ASME B16.9, wrought steel, buttwelded or ASME B16.5, steel flanges and fittings;; with double layer, half-lapped polyethylene tape.
 - 2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings.
 - 3. Joints: Welded in accordance with AWS D1.1.
 - 4. Casing: Polyurethane insulation with high density polyethylene jacket and heat shrink sleeves.
- B. High Density Polyethylene piping approved by code.

2.03 ABOVE GROUND SPRINKLER AND STANDPIPE PIPING (F)

- A. Steel Pipe: ASTM A 53 Schedule 40 or ASTM A 135 Schedule 10, black.
 - 1. Steel Fittings: ASME B16.9, wrought steel, buttwelded or ASME B16.5, steel flanges and fittings.
 - 2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.

3. Mechanical Grooved Couplings: Ductile iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, electroplated steel bolts, nuts, and washers; galvanized for galvanized pipe.
 - a. Rigid Type: Housings shall be cast with offsetting angle-pattern bolt pads to provide rigidity and system support and hanging in accordance with NFPA-13. (Couplings shall be fully installed at visual pad-to-pad offset contact. Tongue and recess type couplings, or any coupling that requires exact gapping of bolt pads on each side of the coupling at specific torque ratings, are not allowed).
 - 1) 1-1/4" through 4": Installation ready couplings, for direct stab installation without field disassembly. Victaulic Style 009-EZ (or approved equal).
 - 2) 5" through 8": Victaulic FireLock Style 005 (or approved equal).
 - 3) 10" and larger: Victaulic Zero-Flex Style 07 (or approved equal).
 - b. Flexible Type: For use in locations where vibration attenuation and stress relief are required, and for seismic applications in accordance with the manufacturer's written instructions. Victaulic Style 77.
 - c. Gasket Guide:
 - 1) Dry Systems (Ambient Temperature Range) - Use FlushSeal®, Grade EPDM, Type A gasket.
 - 2) Freezer Applications (-30 degrees F to 0 degrees F) - Use FlushSeal®, Grade L, Silicone gasket.
 - 3) Water/Wet Systems (Ambient Temperature Range) - Use Grade EPDM, Type A gasket.
4. Mechanical Formed Fittings: Carbon steel housing (zinc electroplated exterior) with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe. UL listed and FMG approved to 175 psig CWP. Victaulic Pressfit® (or approved equal).
 - B. Preaction and Dry type system piping and fittings shall be schedule 40 galvanized steel.
 - C. Antifreeze loop system piping and fittings downstream of fill cup shall be schedule 40 galvanized steel.
 - D. Minimum System Pressure Rating: 175 psig.
 - E. Isolation valves:
 1. Outside stem and yoke gate valves (OS&Y). Victaulic Series 771 (or approved equal).
 2. Grooved end butterfly valves with weatherproof actuator. Victaulic Series 705W (or approved equal).

2.04 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
- E. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
- F. Vertical Support: Steel riser clamp.
- G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

- H. In grooved installations, use Victaulic Style 009, 005, or 07 (or approved equal) rigid couplings with offsetting angle-pattern bolt pads, which permit support and hanging in accordance with NFPA-13.

2.05 GATE VALVES

- A. Up to and including 2 inches:
1. Bronze body, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.
- B. Over 2 inches:
1. Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid bronze or cast iron wedge, flanged ends, with backseating capacity (repackable under pressure).
 2. Ductile iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, EPDM coated cast iron wedge, grooved ends, with backseating capacity (repackable while in line). Victaulic Series 771 (or approved equal).
- C. Over 4 inches:
1. Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly.
 2. Iron body, bronze trim, non-rising stem with bolted bonnet, EPDM coated cast iron wedge, grooved ends, iron body indicator post assembly. Victaulic Series 772 valve with Series 773 wall post (or approved equal) or Series 774 upright post (or approved equal).

2.06 BALL VALVES

- A. Up to and including 2 inches:
1. Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, threaded or soldered ends with union.
 2. Bronze two piece body, brass, chrome plated brass ball, teflon seats and stuffing box ring, weatherproof actuator with handwheel and two single-pole double-throw supervisory switches, threaded or grooved ends. Victaulic Series 728 (or approved equal).
- B. Over 2 inches:
1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle or gear drive handwheel for sizes 10 inches and over, flanged.
 2. Ductile iron body, chrome plated steel ball, TFE seat, fluoroelastomer seals, lever handle or gear operated, with grooved ends. (unlisted) Victaulic Series 726 (or approved equal).

2.07 BUTTERFLY VALVES

- A. Bronze Body:
1. Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and built-in tamper proof switch rated 10 amp at 115 volt AC.
- B. Cast or Ductile Iron Body
1. Cast or ductile iron, 2-1/2 inch and larger body, bronze disc, stainless steel stem, resilient replaceable EPDM seat (for service not less than 250 degrees F), full lug type body to fit between ANSI class 150 flanges, extended neck, bronze bearings on upper and lower shafts, position indicators and memory stops. Provide lever operator (10 position) for sizes through 4 inches and lubricated enclosed screw or worm gear operator for larger sizes. Valves shall be bubble tight against maximum expected external pressure differential and shall be capable of deadend, and internal tamper switch rated 10 amp at 115 volt AC.

C. Ductile Iron Grooved End Body

1. Ductile iron, 2-1/2 inch and larger body, EPDM coated ductile iron disc with integrally cast stem (for service to 230 degrees F), grooved end body for installation with couplings of the same manufacturer, stainless steel backed Teflon impregnated fiberglass bearings, 416 stainless steel stem nuts, EPDM O-ring, with weatherproof actuator and two single-pole double-throw supervisory switches rated 10 amp at 125 volt AC. Victaulic Series 705W (or approved equal).

2.08 SWING CHECK VALVES

A. Up to and including 2 inches:

1. Bronze body and swing disc, rubber seat, threaded or soldered ends.

B. Over 2 inches:

1. Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends with automatic ball check.
2. Ductile iron body, swing check with stainless steel disc and shaft, with EPDM seat, and grooved ends. Victaulic Series 712 (or approved equal).

C. 2-1/2 inches and Over:

1. Spring-actuated ductile iron body, aluminum-bronze or elastomer coated ductile iron disc, stainless steel spring and shaft, grooved ends. UL listed and FMG approved for operating service to 250 psig CWP. Victaulic Series 717 (or approved equal).

D. 4 inches and Over:

1. Iron body, bronze disc, stainless steel spring, resilient seal, threaded, wafer, or flanged ends.

2.09 DRAIN VALVES

A. Compression Stop:

1. Bronze with hose thread nipple and cap.

B. Ball Valve:

1. Brass with cap and chain, 3/4 inch hose thread.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with Mechanical Grooved Couplings (Victaulic or approved equal), flanges or unions.

3.02 INSTALLATION

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13 (or 13R where allowed by code), Owner's Insuring Agency requirements, and requirements of local authorities having local jurisdiction.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Sleeve pipes passing through partitions, walls, and floors.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected

equipment.

1. For water systems, use adequate numbers of Victaulic Style 75 or 77 (or approved equal) flexible couplings in header piping to accommodate thermal growth and contraction, and for the elimination of expansion loops. (In accordance with manufacturer's instructions) Where expansion loops are required, use flexible couplings on the loops.

G. 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 recessed into and grouted flush with slab.

H. Pipe Hangers and Supports:

1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
2. Place hangers within 12 inches of each horizontal elbow.
3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
4. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
6. Prime coat exposed steel hangers and supports. Refer to Section 09 9000. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

I. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Section 09 9000.

K. Do not penetrate building structural members without coordination with/approval from Structural Engineer.

L. Provide sleeves when penetrating footings, floors, and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.

M. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

N. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

O. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.

P. Provide gate or butterfly valves for shut-off or isolating service.

Q. Provide drain valves at main shut-off valves, low points of piping and apparatus. Drain to floor

drains via air gap, refer to plumbing plans for floor drain locations (coordinate with plumbing trades).

- R. Where portions of systems are subject to freezing and temperatures cannot be reliably maintained at or above 40 degrees F (i.e. attic spaces, crawl spaces, loading docks, etc.), sprinklers shall be installed as a dry pipe or preaction system.
- S. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be of an elastomer grade suitable for the intended service, and shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. Note: A distributor's representative is not considered qualified to conduct the training or jobsite visit(s).
- T. Install Victaulic Pressfit® (or approved equal) in accordance with manufacturer's recommendations. Pipe shall be square cut (+/-0.030", properly deburred, and cleaned. Pipe ends shall be marked with a gauge supplied by the manufacturer. Use a Victaulic 'PFT' series (or approved equal) tool with the proper sized jaw for pressing.

END OF SECTION

SECTION 21 0553

IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.
- B. Champion America, Inc.: www.Champion-America.com.
- C. Seton Identification Products: www.seton.com/aec.

2.02 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/4 inch.
 - 3. Background Color: Black.

2.03 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.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.04 PIPE MARKERS

- A. Color: Conform to 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. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install 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 underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- E. Identify pumps and valves with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- F. Identify control panels and major control components outside panels with plastic nameplates.
- G. Identify valves in main and branch piping with tags.
- H. Tag automatic controls, instruments, and relays. Key to control schematic.
- I. Identify piping with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. 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.

END OF SECTION

SECTION 21 1300

FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. System design, installation, and certification.

1.02 REFERENCE STANDARDS

- A. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements.
- B. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements.
- C. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements.
- D. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
- E. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc..

1.03 SUBMITTALS

- A. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- B. Shop Drawings for sprinkler systems:
 - 1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
 - 2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
 - 3. Submit shop drawings, product data, and hydraulic calculations to authority having jurisdiction, and Fire Marshall for approval. Submit proof of approval to ENGINEER.
 - 4. All shop drawings and calculations shall be prepared by a licensed Professional Fire Protection Engineer experienced in design of this type of work and bear the Professional Fire Protection Engineer's seal/signature.
 - 5. All drawings shall be prepared as .dxf or .dwg CAD drawings.
- C. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.
- D. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.
- E. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.
- F. Maintenance Materials: Furnish the following for OWNER's use in maintenance of project.
 - 1. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
 - 2. Sprinkler Wrenches: For each sprinkler type.

1.04 QUALITY ASSURANCE

- A. Maintain one copy of referenced design and installation standard on site.

- B. Conform to UL requirements.
- C. The Fire Protection Contractor shall design and install the fire protection system under direct supervision of a Professional Fire Protection Engineer experienced in design of this type of work and licensed in PROJECT LOCATION. All shop drawings and calculations shall be prepared by a licensed Professional Fire Protection Engineer experienced in design of this type of work and bear the Professional Fire Protection Engineer's seal/signature.
- D. All equipment and components shall be FMRC approved and shall bear FMRC labels or markings.
- E. Perform design and work in accordance with NFPA 13 (or NFPA 13R where allowed by code), FMRC data sheets, and other applicable NFPA requirements, and Owner's insurance requirements (if applicable).
- F. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 10 years documented experience.
- G. Installer Qualifications: Company specializing in performing the work of this section with minimum 10 years experience.
- H. Equipment and Components: Provide products that bear UL label or marking.
- I. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.05 HYDRAULIC DESIGN CRITERIA

- A. Locate risers as indicated on the plans, full size from flange above finished floor to feed the main.
- B. Hydraulic calculations shall begin at outlet connection of the city water meter or connection into the distribution system with pipe friction based upon Hazen-Williams coefficients.
- C. Perform design and work in accordance with NFPA 13 (or NFPA 13R where allowed by code), FMRC data sheets, and other applicable NFPA requirements, and Owner's insurance requirements (if applicable).
- D. Fire Protection Contractor shall verify existing pressure/flow parameters with local water supply utility, and make pressure and flow tests to determine the available water supply parameters.
- E. Water velocity in the piping shall not exceed the following criteria:
 - 1. Underground mains: 16 ft./sec.
 - 2. Aboveground mains: 32 ft./sec. 20 ft./sec. if Owner's Insurance Agency is FMRC.
 - 3. Sprinkler branch lines: 32 ft./sec. 20 ft./sec. if Owner's Insurance Agency is FMRC.
- F. Base hydraulic calculations on maximum density for each sprinklered area, plus hose allowances required, plus 15% unbalance for each area, starting from the outlet connection through the loop of each zone.
- G. Provide inspector's test connections per NFPA 13 and FMRC Data sheet 2-8N. Locate as indicated on the drawings, or as required.

1.06 REGULATORY REQUIREMENTS

- A. Hydraulic calculations, product data and shop drawings shall bear stamp of approval of local Authorities having jurisdiction and the Owner's Insurance Underwriter.
- B. Conform to NFPA 13 (or NFPA 13R where allowed by code) for installation and testing of sprinkler systems.
- C. The provisions and requirements of the NFPA and/or the Owner's insurance underwriter constitute mandatory minimum requirements for work specified herein.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.08 EXTRA MATERIALS

- A. Provide extra sprinklers of type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
- B. Provide suitable wrenches for each sprinkler type.
- C. Provide 2 extra sprinkler heads of each type of sprinkler.

PART 2 PRODUCTS

2.01 SPRINKLER MANUFACTURERS

- A. Star Sprinkler Products.
- B. Grinnel Corp.
- C. Viking.
- D. Reliable.

2.02 GENERAL PRODUCT REQUIREMENTS

- A. A main drain valve shall be installed, and auxiliary drains installed, wherever the plane of the piping changes (at low points in the line) to properly drain all parts of the system. Coordinate work with all other trades. Provide metal air gap fittings for connection to the underground drainage system. Main drain shall be 2 inch test and drain pipe connected to riser. Pipe to safe waste. Provide approved angle valve and pressure gauge with inspector's 1/4 inch test plug.
- B. Provide a pressure gauge with valve connections at the top of each riser and standpipe, in an easily visible/accessible location, such as a stairwell.
- C. Drain and isolation valves shall be provided at the base of each riser. The standpipe system within the building shall be interconnected.

2.03 SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for entire building.
- B. Occupancy: Per the Architectural Plans and as required by the authority having jurisdiction.
- C. Water Supply: Fire Protection Contractor shall determine volume and pressure available from existing water flow test data (check with water utility) and/or perform their own flow/pressure testing as required to determine water supply pipe sizing required for the project.
- D. Interface fire protection sprinkler system with building fire and smoke alarm system.
- E. Provide fire department connections where required, coordinate with local fire authority.
- F. Pipe 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.
- G. Note that drawings provided are schematic in nature. Contractor shall provide design and installation of all piping, offsets, fittings, valves, drains, sprinkler heads, etc. as required for a complete and operable system in accordance with NFPA and code requirements.

2.04 SPRINKLERS

- A. Provide standard low velocity sprinkler heads with wide angle spray except as otherwise

specified.

- B. Suspended Ceiling Type: Concealed pendant type with matching push on escutcheon plate.
 - 1. Finish: Enamel, color white (coordinate with Architect).
 - 2. Escutcheon Plate Finish: Enamel, color white (coordinate with Architect).
 - 3. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- C. Exposed Area Type: Standard upright or pendant type with guard as required or as noted on the drawings.
 - 1. Finish: Enamel, color white (coordinate with Architect).
 - 2. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- D. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate and guard.
 - 1. Finish: Enamel, color as selected.
 - 2. Escutcheon Plate Finish: Enamel, color white (coordinate with Architect).
 - 3. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- E. Dry (freezeproof) Sprinklers: Standard pendant type.
 - 1. Finish: Chrome plated.
 - 2. Escutcheon Plate Finish: Chrome plated.
 - 3. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- F. Temperature ratings of heads shall be ordinary temperature, 135 to 170 deg. F, unless noted otherwise.
- G. Sprinkler heads in mechanical rooms, boiler rooms, electrical rooms, storage rooms, elevator machine rooms, and telecommunications rooms shall be rated for 286 deg. F.
- H. Furnish sprinkler head guards in high abuse areas where damage may occur on all exposed sprinklers (e.g. storage rooms, janitor's closets, mechanical rooms, gymnasiums, typical, etc.). Guard finish/color to match sprinkler finish/color.

2.06 BACKFLOW PREVENTOR

- A. Reduced Pressure Principal Type Backflow Preventor (RPZ)
 - 1. Provide reduced pressure principal type valve assembly with two (2) OS&Y gate valves, relief valve with integral monitoring flow switch (contact rating 0.4 amps @ 24V AC).
 - 2. Provide the following options/accessories:
 - a. Air gap fitting.
 - b. Shut off valves shall be thru-the-exterior wall Post Indicator type valves. For projects where the backflow preventer is located without an exterior wall (e.g. basement/below grade applications) the Post Indicator Valve shall be located on the water service supply pipe before entering the building (coordinate with site/civil trades).
 - 3. Manufacturer's:
 - a. Ames.
 - b. CLA-VAL.
 - c. Conbraco Industries: www.conbraco.com.
 - d. Zurn-Wilkins Model 375-MS-PI.

- B. Double Check Valve Type Backflow Preventor
 - 1. Double Check Detector (DCD) Assemblies:
 - a. ASSE 1048, CSA Certified, UL Classified, FM Approved; Epoxy coated ductile iron body with corrosion resistant stainless steel internal parts; two independently operating check valves accessible for maintenance without removing from the line, two full port gate style isolation valves with tamper switches.
 - 2. Provide the following options/accessories:
 - a. Shut off valves shall be thru-the-exterior wall Post Indicator type valves. For projects where the backflow preventer is located without an exterior wall (e.g. basement/below grade applications) the Post Indicator Valve shall be located on the water service supply pipe before entering the building (coordinate with site/civil trades).
 - 3. Manufacturer's:
 - a. Ames.
 - b. CLA-VAL.
 - c. Conbraco Industries: www.conbraco.com.
 - d. Zurn-Wilkins Model 350-PI.

2.07 INSPECTOR'S TEST CONNECTION (ITC)

- A. Inspector's test connection shall consist of 1 inch piping and a 1 inch globe valve and shall permit testing and flushing of lines without shut down of system or loss of fire protection capability. Inspector's test connection shall be fitted with chain attached caps.
- B. Manufacturer's:
 - 1. Seco Mfg. Inc.
 - 2. Elkhart.

2.08 BALL DRIP VALVE

- A. Ball drip valve shall be 3/4 inch cast brass angle or straight connection valve with male NPT both ends.
- B. Manufacturer's:
 - 1. Potter-Roemer Model No. 5980.
 - 2. Seco Mfg.
 - 3. Elkhart Brass Mfg.
 - 4. W.D. Allen Mfg.

2.09 VALVE MONITOR SWITCHES

- A. Valves controlling sprinkler systems shall be supervised open. Provide yoke mounted monitor switch to signal closing of fire system valves. Switch shall be UL listed and FMRC approved, single pole, double throw switch, with a roller type switch activator and a spring loaded plunger mounted in a housing.
- B. Manufacturer's:
 - 1. Grinnel.
 - 2. Notifier.

2.10 FLOW SWITCHES

- A. Sprinkler flow switches shall be provided where indicated on the drawings and required by NFPA

regulations, and local authorities having jurisdiction.

- B. Each water flow switch shall be equipped with an adjustable recycling type retarding device designed to prevent false alarms due to pressure surges within the piping. The flow switch shall be rated for 250 psig working pressure systems.
- C. The switches shall be suitable for 120 volt or 24 volt, AC operation - coordinate with electrical / fire alarm trades.
- D. Each flow switch shall be provided with a set of contacts for connection by Electrical Trades.
- E. Manufacturer's:
 - 1. Grinnel.
 - 2. Central Sprinkler.
 - 3. Potter-Roemer.

2.11 PIPING SPECIALTIES

- A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm and electric alarm, with pressure retard chamber and variable pressure trim; with test and drain valve.
- B. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm and electric alarm, with accelerator; with test and drain valve.
- C. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.
- D. Fire Department Connections:
 - 1. Type: Flush mounted wall type with chrome plated finish.
 - 2. Outlets: Two way with thread size to suit fire department hardware; threaded dust cap and chain of matching material and finish. 4 inch back outlet.
 - 3. Drain: 3/4 inch automatic drip, outside.
 - 4. Label: "Sprinkler - Fire Department Connection".
 - 5. Manufacturers:
 - a. Elkhartt Brass Mfg. No. 166 (wall mounted).
 - b. Potter-Roemer Inc. No. 5710 Series (wall mounted) or 5760 Series (free standing).
 - 6. Coordinate Fire Dept. fill connection requirements (e.g. location, size, connection type, etc.) with Fire Dept./Authority prior to order/rough-in.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Install buried shut-off valves in valve box. Provide post indicator.
- D. Provide approved backflow preventor or double check valve assembly at sprinkler system water source connection.
- E. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.
- F. Place pipe runs to minimize obstruction to other work.

- G. Place piping in concealed spaces above finished ceilings.
- H. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.
- I. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- J. Flush entire piping system of foreign matter.
- K. Install guards on sprinklers where damage may occur on all exposed sprinklers (e.g. storage rooms, janitor's closets, mechanical rooms, gymnasiums, etc.).
- L. Hydrostatically test entire system.
- M. Require test be witnessed by Fire Marshal and authority having jurisdiction.
- N. Install piping per NFPA 13 (or NFPA 13R where allowed by code), the Owner's Insuring Agency, and in accordance with the requirements of local authorities having jurisdiction.
- O. Install line sized drain line from RPZ relief air gap fitting to the outdoors. Provide check valve or terminal backwater valve to prevent rodents/cold air from entering.
- P. Provide 24V control wiring from RPZ relief valve monitoring contact switch to audible/visible alarm (labeled "BACKFLOW RELIEF") located in an approved/conspicuous location.
- Q. Individual sprinkler head branch pipes/armover shall connect to the top of the branch or main pipe.
- R. Minimum run-out to sprinkler heads shall be 1 inch.
- S. Locate and secure valve or hose cabinet plumb and level.
- T. Drawings provided are schematic in nature. Contractor shall provide all piping, offsets, fittings, valves, drains, sprinkler heads, etc. as required for a complete and operable system in accordance with NFPA and FMRC.
- U. Where portions of systems are subject to freezing and temperatures cannot be reliably maintained at or above 40 degrees F (i.e. attic spaces, crawl spaces, loading docks, covered porches/balconies, etc.), sprinklers shall be installed as a dry pipe, pre-action system, or anti-freeze system.

3.02 INSPECTORS TEST CONNECTION (ITC)

- A. Inspector's test connections shall permit testing and flushing of lines without shut-down of system or loss of fire protection capability. Fit with chain attached caps. Install ITC where indicated, and if not indicated, on remote branch lines being supplied by cross-mains so that testing may be accomplished at the "dead corners" of each sprinkler system.

3.03 INTERFACE WITH OTHER PRODUCTS

- A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 22 0001

GENERAL 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 Plumbing systems indicated on the drawings, AND as described in each Section of Division 220000 Specifications, AND applicable Division 210000 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 22 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 their 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.
- D. The Contractor shall be responsible for the complete and satisfactory accomplishment of all Work inclusive of whatever miscellaneous material and/or appurtenances are required to perfect the installation, and demonstrate that all plumbing systems will operate satisfactorily under normal operating conditions.

1.02 DRAWINGS

- A. The drawings are diagrammatic and show the general location and arrangement of equipment, piping and related items. They shall be followed as closely as elements of the construction will permit. The Contractor shall provide/install all plumbing systems, and associated equipment, complete and include all necessary offsets, fittings, and other components required due to interferences, space constraints, code requirements, etc. as required to provide a complete/functional system.
- B. The general 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 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, plumbing drawings in all matters pertaining to plumbing 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 locations of plumbing items that require access (i.e. isolation valves, balance valves, etc.) with reflected ceiling plan. Items located above hard non-accessible ceilings shall be provided with access doors as required.
6. 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.
7. Verify clearance requirements of all electrical and mechanical equipment/systems prior to the installation of any new work. Plumbing equipment, piping, 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. 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 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, plan reviews, 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 latest enforceable rules and regulations set forth in local and state codes.
 - 1. Mechanical and Plumbing systems shall be installed per current jurisdictional codes (i.e. Owner's Building Codes (International Building Codes, confirm Owner's current code to be followed), Michigan Mechanical/Plumbing Codes, current NFPA codes (e.g. NFPA 13/13R, NFPA 101, etc.), and applicable sections of the Michigan Building Code.
- D. In the event that the plans and specifications conflict with any rules, regulations, or codes applying, said rules, regulations and codes shall govern.
- E. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.
- F. Contractor shall prepare any detailed drawings or diagrams which may be required by the governing authorities (i.e. fire protection plans, boiler room layouts, etc.).

1.08 UTILITIES

- A. The CONTRACTOR shall be responsible for coordinating, obtaining service, and advising the OWNER/ENGINEER, and utility company(s) for the domestic water, sanitary sewer, service installations.
- B. 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, sewer, etc.) and coordinate service requirements including, but not limited to, all valves, meters, etc. which will be required.
- C. 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 complete maintenance and operating instructional manuals covering all plumbing 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. Domestic Water Heater DWH-1, Pump P-1, Sink SK-1, etc.).
- D. Internally subdivide the binder contents with permanent page dividers, organized by specification section and/or major equipment/systems (i.e. Plumbing Equipment, Plumbing Fixtures, Plumbing Specialties, 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. Copies of Shop drawings and product data, approved by Architect/Engineer.
 - c. Installation and operational procedures.
 - d. Routine maintenance procedures.
 - e. Trouble shooting procedures.
 - f. Complete parts lists by nomenclature, manufacturer's part number and use.
 - g. Recommended spare parts lists.
 - h. Lubrication chart listing all types of lubricants to be used for each piece of equipment and the recommended frequency of lubrication.
 - i. Complete wiring and schematic diagrams.
 - j. Elevations and/or sections cut through all of the major equipment and sub-assemblies.
 - 3. Part 3: Project documents and certificates, including the following:
 - a. Testing, Adjusting, and Balance Reports (approved by Engineer).
 - b. Warranty Certificates.
 - c. Copies of approved construction permits.
- F. 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. Unless noted otherwise, submit digital (.pdf format) copies of complete manufacturer's shop drawings for all plumbing equipment, valves, specialties, 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 plumbing specifications for additional requirements.
 - 1) 22 0721 Piping Safety Covers.
 - 2) 22 3000 Plumbing Equipment: DWHs.
 - 3) 22 4000 Plumbing Fixtures.

1.13 INSTRUCTION OF OWNER PERSONNEL

- A. Before final inspection the CONTRACTOR shall instruct OWNER's designated personnel in operation, adjustment and maintenance of 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 notes 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.

3.02 WORK INVOLVING OTHER TRADES

- A. Certain items of equipment or materials specified in the Plumbing 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 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.

3.04 CHASE, SHAFTS AND RECESSES

- A. Coordinate with structural, architectural and other trades to ensure accurate location and size of chases, shafts and recesses required for plumbing systems/piping.

3.05 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.

3.06 SEALING OF PLUMBING OPENINGS

- A. Seal the space around pipes and sleeves through walls, floors and ceilings.
- B. Refer to specification 078400-Firestopping.
- C. Provide adequate clearance to allow for proper pipe movement and sealing.
- D. 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.
- E. 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.
- F. 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.
- G. Pipes 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.
- H. Penetrations through fire rated floors and walls shall be fire-stopped in accordance with applicable building code requirements 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. 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.

3.07 CUTTING, CORING AND PATCHING

- A. Refer to General Conditions
- B. The CONTRACTOR shall perform all cutting, coring, and patching that may be necessary for the installation of their Work. All cutting, coring, patching and repair work shall be performed by the CONTRACTOR through qualified Subcontractors. CONTRACTOR shall include full cost of same in his bid.
- C. Secure approval from Architect and/or Structural Engineer, in writing, before cutting, welding/bolting to, or anchoring from any structural building components (i.e. structural steel, load bearing walls, footings/foundations, concrete floors/ceilings, etc.).

3.08 EXCAVATION AND BACKFILLING

- A. Provide all excavation, trenching, tunneling and backfilling required for the plumbing work.
- B. Provide foundations if required to support underground piping.
- C. Refer to Architectural/Structural specification sections for excavation and backfilling details.

3.09 EQUIPMENT FOUNDATIONS AND SUPPORTS

- A. Shall be as required or as shown on plans or specified.
- B. Provide concrete housekeeping pads for all floor mounted plumbing equipment (i.e. expansion tanks, 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 ARCHITECT and/or ENGINEER for same including loads, locations, and methods of attachment.

3.10 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.

3.11 ACCESSIBILITY

- A. All equipment shall be installed so as to be readily accessible for operation, maintenance, and repair, as required by the equipment manufacturer and as subject to the approval of the ENGINEER.

3.12 ACCESS DOORS

- A. The CONTRACTOR, and/or his Subcontractors, shall provide access doors for access to any of their respective plumbing equipment (i.e. valves, controls, 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 trade shall be responsible for removing all debris daily as required to maintain the work area in a neat, orderly condition.
- B. After equipment and systems have been completed and tested, each entire system shall be cleaned and flushed.
- C. Prior to connection of new piping to existing piping systems, all new piping shall be subject to initial flushing, cleaning and final flushing. Provide temporary bypass piping and fittings, temporary valves and strainers, temporary water make-up piping with approved means of backflow prevention, and temporary pumps as needed to perform specified flushing and cleaning requirements.

3.14 PAINTING

- A. All plumbing systems, equipment, piping, 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 Plumbing 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 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 GENERAL SUPPORT REQUIREMENTS

- A. Each 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 from ARCHITECT and/or Structural ENGINEER, in writing, before welding or bolting to steel framing or anchoring to concrete structure.
- C. Where piping, 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.

3.17 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 equipment/fixtures/etc., check latest structural drawings for interferences, etc.

3.18 PIPING SYSTEMS TESTING

- A. Test backflow prevention at connections between potable water and nonpotable water for proper functioning under normal operating conditions. Provide Owner with one (1) copy of the potable water backflow prevention test report.
- B. 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.
- C. Pressure test plumbing 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.
- D. 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.

3.19 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.

3.20 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 plumbing 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.

END OF SECTION

SECTION 22 0519

METERS AND GAGES FOR PLUMBING PIPING

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 DIAL 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: Dial type bimetallic actuated; ASTM E 1; stainless steel case, adjustable angle with front recalibration, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
 1. Size: 5 inch diameter dial.
 2. Size: 3 inch diameter dial.
 3. Lens: Clear glass.
 4. Accuracy: 1 percent.
 5. Calibration: Degrees F.

2.04 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.

2.05 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. Install pressure gages with pulsation dampers. Provide gage cock to isolate each gage.

Extend nipples and siphons to allow clearance from insulation.

- C. 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.
- D. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- E. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- F. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.
- G. Locate test plugs where indicated.

END OF SECTION

SECTION 22 0553

IDENTIFICATION FOR PLUMBING SYSTEMS AND EQUIPMENT

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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Brady Corp.
- B. Champion-America, Inc.
- C. Seton Identification Products.

2.02 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.

2.03 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.

2.04 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.

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 plumbing equipment (i.e. water heaters, pumps, heat transfer equipment, tanks, etc.) with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- G. Identify exposed piping 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.
- H. Paint exposed piping per specification section 09900.

END OF SECTION

SECTION 22 0719

PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.02 REFERENCE STANDARDS

- A. ASTM C 195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
- B. ASTM C 449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
- C. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- D. ASTM C 533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
- E. ASTM C 534/C 534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- F. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation.
- G. ASTM C 795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
- H. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- I. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials.
- J. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association.
- K. 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 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.

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.
- 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.
 3. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, etc. 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.
 3. Finish with tape and white paintable vapor barrier jacket.
 4. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, etc. 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. Shields:
 - 1. 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.
- 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. 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.
- I. Ends of insulation shall be sealed off. Spray paint is not acceptable. There shall be no exposed ends.
- J. Insulation not properly installed shall be removed and replaced or repaired as necessary.

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.
 - b. Cellular Foam Insulation:
 - 1) Pipe Size Range: All sizes.
 - a) Thickness: 1.0 inch.
 - 2. Domestic Hot Water Recirculation:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: 2 inch and smaller.
 - a) Thickness: 1 inch.
 - b. Cellular Foam Insulation:
 - 1) Pipe Size Range: All sizes.
 - 2) Thickness: 1.0 inch
 - 3. Domestic Cold Water:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: All sizes.
 - a) Thickness: 1.0 inch.
 - b. Cellular Foam Insulation:
 - 1) Pipe Size Range: All sizes.
 - 2) Thickness: 1.0 inch
 - 4. Equipment Drain Piping (metal pipes conveying cold condensate drainage):
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: All sizes.

- a) Thickness: 1.0 inch.
- b. Cellular Foam Insulation:
 - 1) Pipe Size Range: All sizes.
 - a) Thickness: 1.0 inch
- 5. 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.

END OF SECTION

SECTION 22 0721

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? Coordinate and confirm with architectural plans.
 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 22 1005

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.

1.02 REFERENCE STANDARDS

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers (ANSI B16.18).
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.
- C. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; The American Society of Mechanical Engineers.
- D. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers (ANSI/ASME B31.9).
- E. ASME (BPV IV) - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; The American Society of Mechanical Engineers.
- F. ASTM A 74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
- G. ASTM B 32 - Standard Specification for Solder Metal.
- H. ASTM B 88 - Standard Specification for Seamless Copper Water Tube.
- I. ASTM B 88M - Standard Specification for Seamless Copper Water Tube (Metric).
- J. ASTM C 564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- 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. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- P. ASTM F 679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
- Q. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association (ANSI/AWWA C111/A21.11).
- R. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association (ANSI/AWWA C151/A21.51).
- S. AWWA C651 - Disinfecting Water Mains; American Water Works Association (ANSI/AWWA C651).

- T. 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.
- U. 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.
- V. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements.
- W. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements.
- X. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements.
- Y. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
- Z. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- AA. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- BB. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- CC. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- DD. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- EE. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- FF. ASTM A 536 - Standard Specification for Ductile Iron Castings.

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. 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.
- E. Pressure test plumbing 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.

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: ASTM A 74 extra heavy weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C 564 neoprene gaskets or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
- C. 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) or sleeved through a steel pipe sleeve.

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. Note: Only use PVC piping where allowed by Building Codes - do not use PVC piping exposed in occupied spaces, or in return air plenums.

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. High Density Polyethylene pipe where allowed by code.
- C. 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: Gate or ball valves for sizes 2 inch and smaller.

2.05 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 2-1/2 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. 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).

2.06 PIPE HANGERS AND SUPPORTS

- A. Plumbing Piping - Drain, Waste, and Vent:
 - 1. Conform to MSS SP-58.
 - 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 MSS SP-58.
 - 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. Vertical Support: Steel riser clamp.
 - 5. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 6. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
 - 7. 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. Other Types: As required.

2.07 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, 2 Inches and Smaller: 300 psi CWP, forged brass two piece body, chrome plated brass ball and stem, regular port, TFE seats and seals, blow-out proof stem, lever handle.
- C. Ball valves for natural gas service shall be UL labeled for such service.

2.08 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.

2.09 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.

2.10 WATER PRESSURE REDUCING VALVES

- A. Manufacturers:
 1. Amtrol Inc.: www.amtrol.com.
 2. Cla-Val Co: www.cla-val.com.
 3. Watts Regulator Company: www.wattsregulator.com.
- B. Up to 2 Inches:
 1. MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.

C. Over 2 Inches:

1. MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.11 RELIEF VALVES

A. Pressure Relief:

1. Manufacturers:
 - a. Cla-Val Co: www.cla-val.com.
 - b. Henry Technologies: www.henrytech.com.
 - c. Watts Regulator Company: www.wattsregulator.com.
2. AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

B. Temperature and Pressure Relief:

1. Manufacturers:
 - a. Cla-Val Co: www.cla-val.com.
 - b. Henry Technologies: www.henrytech.com.
 - c. Watts Regulator Company: www.wattsregulator.com.
2. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labeled.

2.12 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. 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.

C. Size 1-1/2 inch to 4 inch:

1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen. Provide with integral blowdown valve and hose end fitting.

2.13 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.

2.14 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 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 22 0719.
- 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. Provide support for utility meters in accordance with requirements of utility companies.
- K. Install concrete thrust blocks at elbows of underground domestic water service piping.
- L. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 9000.
- M. Install bell and spigot pipe with bell end upstream.
- N. Install valves with stems upright or horizontal, not inverted.
- O. Install water piping to ASME B31.9.
- P. PVC Pipe: Make solvent-welded joints in accordance with ASTM D 2855.
- Q. Sleeve pipes passing through partitions, walls and floors.
- R. Each fixture shall have isolation valves provided.
- S. Minimum underground sanitary pipe size shall be 3", unless noted otherwise.
- T. All fixtures shall be vented in accordance with a venting method approved by the ruling Plumbing Code.

- U. 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.).
- V. 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.
- W. Pipe Hangers and Supports:
 - 1. Install in accordance with MSS SP-89.
 - 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. Support cast iron drainage piping at every joint.
 - 10. 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.
 - 1. Unions are not required in installations using grooved mechanical joint couplings. (The couplings shall serve as unions and disconnect points.)
- 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. Provide spring loaded check valves on discharge of water pumps.

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 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 water service complete with water meter with by-pass valves.
 - 1. Provide sleeve in wall/floor for service main and support at wall with reinforced concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

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 22 1006

PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Floor drains.
- B. Trap Primers / Protectors.
- C. Cleanouts.
- D. Hose bibbs.
- E. Hydrants.
- F. Backflow preventers.
- G. Thermostatic mixing valves.

1.02 REFERENCE STANDARDS

- A. ASME A112.6.3 - Floor and Trench Drains; The American Society of Mechanical Engineers.
- B. ASSE 1011 - Hose Connection Vacuum Breakers; American Society of Sanitary Engineering (ANSI/ASSE 1011).
- C. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering (ANSI/ASSE 1019).

1.03 SUBMITTALS

- A. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.
- B. Operation & 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 service kits for thermostatic mixing valves.
 - 3. Two spare trap seal primers/protectors.

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. Wood Deck Floor Drains:
1. Cast iron body with a steel anchor flange.
 2. Product: Zurn light commercial FD-2240 series, or equal.

2.02 TRAP PRIMERS/PROTECTORS.

- 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.
- D. Trap protectors, with auto-seal closure, may be used where allowed by code.

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 Bibbs (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.

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.

2.06 WASHING MACHINE BOXES AND VALVES

- A. Box Manufacturers:
 - 1. IPS Corporation/Water-Tite: www.ipscorp.com.
 - 2. Oatey: www.oatey.com.
 - 3. Zurn Industries, Inc.: www.zurn.com.
- B. Description: Plastic preformed rough-in box with brass long shank valves with wheel handles, socket for 2 inch waste, slip in finishing cover.
 - 1. Provide fire rated back box, meeting wall rating, where located within fire rated walls. Refer to Architectural plans for wall ratings and locations.

2.07 REFRIGERATOR VALVE AND RECESSED BOX

- A. Box Manufacturers:

1. IPS Corporation/Water-Tite: www.ipscorp.com.
 2. Oatey: www.oatey.com.
 3. Zurn Industries, Inc.: www.zurn.com.
- B. Description: Plastic preformed rough-in box with brass valves with wheel handle, slip in finishing cover.
1. Provide fire rated back box, meeting wall rating, where located within fire rated walls. Refer to Architectural plans for wall ratings and locations.

2.08 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. Zurn-Wilkins.
 - e. 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 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".
4. 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 or trap protector.
 - a. Trap Primers/Protectors:
 - 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 fire sprinkler systems, interior and exterior hose bibbs, etc.
- E. Pipe relief from backflow preventer to nearest drain.
- 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 22 3000

PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water Heaters.

1.02 REFERENCE STANDARDS

- A. UL 174 - Standard for Household Electric 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 electrical characteristics and connection requirements.
- B. Shop Drawings:
 - 1. Indicate heat exchanger dimensions, size of tapings, and performance data.
 - 2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tapings, 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. Electric Water Heaters: UL listed and labeled to UL 174 or UL 1453.
- C. Water Tanks: ASME labeled, to ASME (BPV VIII, 1).
- 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.

PART 2 PRODUCTS

2.01 WATER HEATER MANUFACTURERS

- A. A.O. Smith Water Products Co: www.hotwater.com.
- B. Rheem Manufacturing Company: www.rheem.com.
- C. Lochinvar.
- D. Bradford White.

2.02 RESIDENTIAL ELECTRIC WATER HEATERS

- A. Type: Automatic, electric, vertical storage.
- B. Tank: Glass lined welded steel, thermally insulated with one inch thick glass fiber; encased in corrosion-resistant steel jacket; baked-on enamel finish.
- C. Controls: Automatic water thermostat with externally adjustable temperature range from 120 to 170 degrees F, flanged or screw-in chrome elements, enclosed controls and electrical junction box and operating light. Wire double element units so elements do not operate simultaneously.
- D. Accessories: Provide:
 - 1. Water Connections: Brass.
 - 2. Dip tube: Brass.
 - 3. Drain Valve.
 - 4. Anode: Magnesium
 - 5. Temperature and Pressure Relief Valve: ASME labeled.

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.

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 electrical work to achieve operating system.
- C. Domestic Water Storage Tanks:
 - 1. Provide steel pipe support, independent of building structural framing members.
 - 2. Clean and flush after installation. Seal until pipe connections are made.

END OF SECTION

SECTION 22 4000

PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water closets.
- B. Lavatories.
- C. Sinks.
- D. Bathtub/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.
- C. ASME A112.19.2 - Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals; 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, lavatory supply fittings, shower heads, and toilet seats.

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.
 4. Zurn Compnay: www.zurn.com.
 5. Mansfield.
- B. Refer to plumbing fixture schedule.
- C. Seat:
1. Solid white plastic, closed front with cover, with self-sustaining hinge and slow closure.

2.02 LAVATORIES

- A. Lavatory Manufacturers:
1. American Standard Inc.: www.americanstandard.com.
 2. Eljer.
 3. Kohler Company: www.kohler.com.
 4. Zurn.
 5. Mansfield.
- 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 or flexible supplies.

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 or flexible supplies.

2.04 BATHTUBS AND SHOWERS

- A. Bathtub Manufacturers:
1. American Standard Inc.: www.americanstandard.com.
 2. Eljer.
 3. Kohler Company: www.kohler.com.
 4. Aqua Glass CorporationNone - N/A: www.aquaglass.com.
- B. Refer to plumbing fixture schedule.

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 or flexible S.S 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" or "Basin-Guard" 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 SCHEDULES

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated below or on Architectural plans/elevations.
 - 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. Shower Heads:
 - a. Adult Male: 69.5 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: 3-4 Inch.
 - c. Vent: 2 Inch.
 - 2. Lavatory:
 - a. Hot Water: 1/2 Inch.
 - b. Cold Water: 1/2 Inch.
 - c. Waste: 1-1/2 – 2 Inch.
 - d. Vent: 1-1/2 Inch.

3. Sink:
 - a. Hot Water: 1/2 Inch.
 - b. Cold Water: 1/2 Inch.
 - c. Waste: 1-1/2 - 2 Inch.
 - d. Vent: 1-1/2 Inch.
4. Bathtub:
 - a. Hot Water: 1/2 Inch.
 - b. Cold Water: 1/2 Inch.
 - c. Waste: 1-1/2 - 2 Inch.
 - d. Vent: 1-1/2 Inch.
5. Shower:
 - a. Hot Water: 1/2 Inch.
 - b. Cold Water: 1/2 Inch.
 - c. Waste: 1-1/2 – 2 Inch.
 - d. Vent: 1-1/2 Inch.
6. Hose Bibs and Wall Hydrants:
 - a. Cold Water: 3/4 Inch.

END OF SECTION

SECTION 23 0001

GENERAL MECHANICAL 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 systems indicated on the drawings, AND as described in each Section of Division 230000 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 230000 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 their 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.
- D. The Contractor shall be held responsible for the complete and satisfactory accomplishment of all Work inclusive of whatever miscellaneous material and/or appurtenances are required to perfect the installation, and demonstrate that all mechanical systems will operate satisfactorily under normal operating conditions.

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. The Contractor shall provide/install all mechanical systems, and associated equipment, complete and include all necessary offsets, fittings, and other components required due to interferences, space constraints, code requirements, etc. as required to provide a complete/functional system.
- B. The general mechanical 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 shall 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 mechanical equipment spaces or electrical

clearances. 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 and/or Engineer of any conflicts between shop drawings and plans.
 4. 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.
 5. 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.
 6. 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. 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, 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 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, plan reviews, 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 most current rules and regulations set forth in local and state codes.
 - 1. Mechanical and Plumbing systems shall be installed per current jurisdictional codes (i.e. Owner's Building Codes (International Building Codes, confirm Owner's current code to be followed), Michigan Mechanical/Plumbing Codes, current NFPA codes (e.g. NFPA 13/13R, NFPA 101, 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.
- E. Contractor shall prepare any detailed drawings or diagrams which may be required by the governing authorities (i.e. fire protection plans, boiler room layouts, etc.).

1.08 SUBSTITUTION ITEMS REQUIRING PRIOR APPROVAL

- A. All items that the Contractor proposed to use in the work that are not specifically named in the contract documents must be submitted for review. 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.

1.09 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.

1.10 OPERATION AND MAINTENANCE INSTRUCTIONAL MANUALS

- A. Provide complete 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. Air Handling Unit AHU-1, Exhaust Fan EF-1, etc.).
 - D. Internally subdivide the binder contents with permanent page dividers, organized by specification section and/or major equipment/systems (i.e. Boilers, Air Handling Units, 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. Copies of Shop drawings and product data, approved by Architect/Engineer.
 - c. Installation and operational procedures.
 - d. Routine maintenance procedures.
 - e. Trouble shooting procedures.
 - f. Complete parts lists by nomenclature, manufacturer's part number and use.
 - g. Recommended spare parts lists.
 - h. Lubrication chart listing all types of lubricants to be used for each piece of equipment and the recommended frequency of lubrication.
 - i. Complete wiring and schematic diagrams.
 - j. Elevations and/or sections cut through all of the major equipment and sub-assemblies.
 - k. At the end of each section, a maintenance schedule shall be provided for each piece of equipment. The schedule shall display the daily, weekly, monthly, semi-annual, and annual lubrication and preventative maintenance required in order to meet warranty conditions and the manufacturer's recommendations for optimal performance and life of the equipment. Photos or reproduction of the manufacturer's literature will not be accepted.
 - 3. Part 3: Project documents and certificates, including the following:
 - a. Testing, Adjusting, and Balance Reports (approved by Engineer).
 - b. Warranty Certificates.
 - c. Copies of approved construction permits.
 - F. 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.

1.11 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. Unless noted otherwise, submit digital (.pdf format) 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) 23 3423 HVAC Power Ventilators.
 - 2) 23 3700 Air Outlets and Inlets.
 - 3) 23 8101 Terminal Heat Transfer Units.
 - 4) 23 8113 Packaged Terminal Air-Conditioners.

1.12 INSTRUCTION OF OWNER PERSONNEL

- A. Before final inspection the Contractor shall instruct Owner's designated personnel in operation, adjustment and maintenance of mechanical 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.
- E. Training shall be provided by factory authorized/trained representatives familiar with the startup and training on the equipment.

1.13 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 mechanical 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. 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.

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 required for mechanical systems.

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. Refer to specification 078400-Firestopping.
- C. Provide adequate clearance to allow for proper duct/pipe movement and sealing.
- D. 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.
- E. 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.
- F. 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.
- G. 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.
- H. Penetrations through fire rated floors and walls shall be firestopped in accordance with applicable building code requirements 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. 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. Unless specifically noted otherwise, the Contractor shall perform all cutting, coring, and patching that may be necessary for the installation of their Work. All cutting, coring, patching and repair work shall be performed by the Contractor through qualified Subcontractors. Contractor shall include full cost of same in his bid.
- C. Secure approval from Architect and/or Structural Engineer, in writing, before cutting, welding/bolting to, or anchoring from any structural building components (i.e. structural steel, load bearing walls, footings/foundations, concrete floors/ceilings, etc.).

3.09 EXCAVATION AND BACKFILLING

- A. Provide all excavation, trenching, tunneling and backfilling required for the mechanical work.
- B. Provide foundations if required to support underground piping.
- C. 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. 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.

3.11 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 ductwork connections to air handling equipment shall be made with flexible duct connectors.

3.12 ACCESSIBILITY

- A. All equipment shall be installed so as to be readily accessible for operation, maintenance, and repair, as required by the equipment manufacturer and as subject to the approval of the Engineer.

3.13 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.

3.14 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. After equipment, ductwork systems have been completed and tested, each entire system shall be cleaned and flushed.

3.15 PAINTING

- A. All mechanical systems, equipment, ductwork, etc. exposed in finished areas shall be painted to match the surrounding finishes. Refer to specification section 09900 - Coordinate color with Architect.

3.16 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.

3.17 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.

3.18 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 from Architect and/or 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.
- D. Hangers for ductwork 48 inches and wider located in Mechanical Rooms shall be sized to also support fire protection system branch piping.

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 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.

3.21 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.

END OF SECTION

SECTION 23 0553

IDENTIFICATION FOR HVAC SYSTEMS AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Ductwork: Plastic Tape Duct Markers.
- C. Instrumentation: Tags.
- D. Small-sized Equipment: Tags.
- E. Thermostats: Nameplates.

2.02 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.
- B. Champion America, Inc.: www.Champion-America.com.
- C. Seton Identification Products: www.seton.com/aec.

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 inch.
 - 3. Background Color: Conform to ANSI/ASME A13.1, unless specified otherwise.

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 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.
- B. Verify Owner's existing identification standard and provide new identification to match.

3.02 INSTALLATION

- A. Install 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. Identify mechanical equipment (i.e. air handling units, equipment, etc.) with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

- D. Identify thermostats relating to terminal boxes or valves with nameplates.
- E. 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.
- F. Paint exposed piping and ductwork per specification section 09900.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

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. 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 .pdf format, complete with with cover identification and TOC/Index. 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 CONTRACTOR.
 - h. Project altitude.
 - i. Report date.
- E. 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, Inc.: 10381 E. Cherry Bend Rd. #A, Traverse City, MI 49684, (231-929-0940) - Contact Kevin Heikkila (cell: 231-499-5666)..
 - 2. International Test & Balance Inc.: Southfield, MI (248-559-5864).
 - 3. Aerodynamics Inspecting Co.: Dearborn, MI (313-584-7450).
 - 4. Hi-Tech Test & Balance: Freeland, MI (989-695-5498).
 - 5. Northern Test and Balance: Traverse City, MI (231-492-5900).

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. 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.
- E. All test points, balance valves, mechanical identification, etc. shall be complete and accessible to the TAB sub-contractor.

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. Access doors are closed and duct end caps are in place.
 - 9. Air outlets are installed and connected.
 - 10. Duct system leakage is minimized.
- 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 2 weeks prior to starting TAB work.
 - 1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- B. Provide additional balancing devices as required.
- C. 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, 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, 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.

3.07 AIR SYSTEM PROCEDURE

- A. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- B. 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.
- C. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- D. Check dampers for proper position to achieve desired airflow path.
- E. Check for airflow blockages.
- F. Check for proper sealing of air duct system.
- G. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.
- H. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of

duct.

- I. Measure air quantities at air inlets and outlets.
- J. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- K. 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.
- L. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- M. 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.
- N. Adjust outside air, return air, supply air, and exhaust air dampers/grilles/diffusers for design conditions.
- O. 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. 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. 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 SCOPE

A. Test, adjust, and balance the following:

1. Packaged Terminal Air Conditioning Units
2. Fans
3. Air Inlets and Outlets

3.11 MINIMUM DATA TO BE REPORTED

A. Items:

1. 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
2. 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
3. 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
4. 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
5. 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 23 0713

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 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.

1.04 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.

1.05 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 (Enhanced Surface Fiberglass)

- A. Manufacturers:
 - 1. CertainTeed Corporation; ToughGard R Duct Liner with Enhanced Surface: www.certainteed.com.
- B. Insulation: Incombustible glass fiber complying with ASTM C 1071; NAIMA and NFPA 90A/90B; rigid board; impregnated surface and edges coated with enhanced surface which is 40% more water repellent than standard fiberglass duct liner.
 - 1. Apparent Thermal Conductivity: Maximum of ASTM C518, 0.24 at 75 degrees F.
 - 2. Service Temperature: Up to 250 degrees F.
 - 3. Rated Velocity on Coated Air Side for Air Erosion: 6,000 fpm, minimum.
 - 4. Density: 1.5 lb./cu.ft. for 1", 1.5", and 2" thickness. 2 lb./cu.ft. for 1/2" thickness.
 - 5. Minimum Noise Reduction Coefficients (NRC) per ASTM E795:
 - a. 1/2 inch Thickness: 0.45.
 - b. 1 inch Thickness: 0.70.
 - c. 1-1/2 inches Thickness: 0.90.
 - d. 2 inch Thickness: 1.00.
 - 6. Corrosion Resistance: pass ASTM C665.
 - 7. Bacteria Resistance: pass ASTM G22.
 - 8. Fungal Resistance: pass ASTM C1338 & ASTM G21.
 - 9. Water Repellency Rating > 4 (INDA IST 80.6-92).
- C. Adhesive: Waterproof, fire-retardant type.
- D. Liner Fasteners: Galvanized steel, impact applied with integral head.

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, 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, 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.
- 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 have been wetted shall be replaced entirely.
 2. Secure fiberglass duct liner insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for spacing.
 3. Seal and smooth joints. Seal and coat transverse joints.
 4. Seal liner surface penetrations with adhesive.
 5. 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.
 6. Metal nosing shall be applied to all upstream transverse edges to additionally secure the insulation.
 7. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.
 8. Note that ducts lined with duct liner are not required to have additional external duct insulation, except for ducts in unconditioned attics or crawl spaces which shall be provided with exterior insulation specified.

3.03 SCHEDULES

- A. Outside Air Intake Ducts:
1. Flexible Glass Fiber Duct Insulation: 3 inches thick.
 2. Rigid Glass Fiber Duct Insulation: 3 inches thick.
- B. Plenums:
1. Rigid Glass Fiber Duct Insulation: 3 inches thick.
- C. SA/RA Ductwork (i.e. Supply Air, Return Air) Within 15 ft. of PVAC units:

1. SA Rigid Glass Fiber Duct Liner Insulation: 1 inches thick.
 2. RA Rigid Glass Fiber Duct Liner Insulation: 1/2 inches thick.
- D. Ducts Exposed to Outdoors or Outdoor Air Temperatures (i.e. Outdoors, Attics, Soffits, or Crawlspace):
1. Flexible Glass Fiber Duct Insulation: 6 inches thick (2-layers of 3" thick - Minimum R-16 installed).
 2. Rigid Glass Fiber Duct Insulation: 6 inches thick (2-layers of 3" thick - Minimum R-16 installed).

END OF SECTION

SECTION 23 3100

HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ductwork.

1.02 REFERENCE STANDARDS

- A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association.
- C. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association.
- D. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association.
- E. 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.

1.07 DESIGN REQUIREMENTS

- A. Duct sizes shown on drawings are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- B. Variation of duct configuration or sizes is permitted, so long as the interior area is not reduced. 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
 4. Rectangular Industrial Duct Construction
 5. Round Industrial Duct Construction
- 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.

1.09 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.
- G. Transfer Air and Sound Boots: 1/2 inch w.g. pressure class, galvanized steel with acoustical duct liner.

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. Semco.
 - c. LaPine Metal Products.
 - d. United-McGill.
 - e. Univarsal Spiral Air.

- D. Caulk: Elastomer caulk, UL listed and per NFPA 90A.
- E. Heat Shrinkable Sealant: Heat shrinkable polyethylene bands with heat softening epoxy for round slip fit duct joints. For use on all round seal Class A joints with exception of polyvinyl chloride coated ductwork.
- F. 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" or Equal.
- G. Reinforcing and Supports:
 - 1. Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim, and angles for support of ductwork.
 - 2. Welded reinforcement and supports shall be structural steel black iron painted with zinc rich paint.
 - 3. 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.
 - 4. Flanges in contact with the airstream shall be of the same material as the ductwork.
 - 5. Bolts and fasteners for galvanized steel duct work shall be carbon steel, zinc coated per ASTM A153.
 - 6. All hangers shall provide a means of vertical adjustment after erection.
- H. 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.
 - 2. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
 - 3. 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.
 - 4. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

2.04 DUCT MANUFACTURERS

- A. Metal-Fab, Inc.
- B. Semco, Inc.
- C. United McGill Corporation.

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. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- D. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- F. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- G. Use double nuts and lock washers on threaded rod supports.
- H. At exterior wall louvers, seal duct to louver frame and install blank-out panels.
- I. Provide flexible duct connections where ductwork connects to fans, air handling equipment, and other rotating equipment and/or where indicated on the drawings.
- J. Provide straight runs of ductwork at fans, coils, air terminal units, and other equipment per manufacturer's recommendations.
- K. 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.
- L. Where ducts pass through walls and floors, finish wall openings with metal trim strips and curb floor openings. Wood frames are not permitted.
- M. Install airfoil turning vanes in all rectangular mitered elbows, whether indicated on drawings or not.

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.

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.

END OF SECTION

SECTION 23 3300

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct access doors.
- B. Duct test holes.
- C. Fire dampers.
- D. Flexible duct connections.
- E. 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. NFPA 92A - Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences.
- C. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.
- D. UL 33 - Heat Responsive Links for Fire-Protection Service; Underwriters Laboratories Inc..
- E. UL 555 - Standard for Fire Dampers; Underwriters Laboratories Inc..

1.03 PROJECT RECORD DOCUMENTS

- A. Record actual locations of access doors.

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.
- C. Fire and Combination Fire/Smoke Dampers:
 - 1. Dampers shall meet requirements for combination fire smoke dampers in accordance with:
 - a. NFPA 80, 90A, 92A, 92B, and 101.
 - b. CSFM Fire Damper Listing.
 - c. CSFM Leakage (Smoke) Damper Listing.
 - d. Applicable Building Codes.
 - 2. Dampers shall be tested, rated, and labeled in accordance with:
 - a. UL 555, Listing R13317
 - b. UL 555S, Listing R13317

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.
- B. Handling: Handle and lift dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

1.07 EXTRA MATERIALS

- A. Provide two of each size and type of fusible link.

PART 2 PRODUCTS**2.01 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.

2.02 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.

2.03 FIRE 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. Refer to architectural drawings for wall construction and fire ratings.
- C. Fire dampers shall be installed where shown and noted on the plans and in all ducts passing through designated fire rated assemblies. Refer to architectural plans for fire rated assembly types and locations.
- D. Fire dampers shall bear the UL label.
- E. Fire dampers shall be minimum 1-1/2 hour rated.
- F. All fire dampers shall be "dynamic" rated.
- G. All fire dampers shall have heavy gauge, aluminum, airfoil blades.
- H. All fire dampers shall be installed in the same manner in which they were tested.
- I. When fire dampers cannot be installed in a fire rated assembly being protected, install fire damper in a 10 gauge steel sleeve, and extend sleeve through opening in fire rated assembly being protected with retaining angles, in manner approved by State and local fire marshalls.
- J. Provide access doors to all fire dampers.

- K. Fire dampers located in low pressure ductwork shall be UL listed with type "B" frame providing a minimum 95% free area.
- L. Location of fire dampers shall be such that the damper housing is integral with the fire wall/assembly. Access panels to the fusible links shall be located such that the fusible link and damper can be maintained and shall be suitable for temperatures of 150 degrees F, and pressure of 6 inches WG.
- M. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- N. Ceiling Dampers: Aluminum, 22 gage frame and 16 gage flap, two layers 0.125 inch ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.
- O. Horizontal Dampers: Aluminum, 22 gage frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.
- P. Curtain Type Dampers: Heavy gauge aluminum with airfoil blades. Provide stainless steel closure springs and latches for horizontal installations or closure under air flow conditions. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height.
- Q. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers. Fusible links for fire dampers in kitchen hood exhaust ductwork shall separate at 286 degrees F.

2.04 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.

2.05 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 PREPARATION

- A. Examine areas to receive dampers. Notify the Engineer of conditions that would adversely affect installation or subsequent utilization of dampers. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 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 23 3100 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 fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, 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.
- I. Fire and Combination Fire/Smoke damper installation:
 - 1. Provide fire dampers and combination fire and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges. Refer to architectural plans for wall construction and fire/smoke ratings.
 - 2. Dampers must be accessible to allow inspection, adjustment, and replacement of components. The sheet metal contractor shall furnish any access doors in ductwork or plenums required to provide this access. The general contractor shall furnish any access doors required in walls, ceilings, or other general building construction.

3. Install dampers square and free from racking.
4. Do not compress or stretch the damper frame into the duct or opening.
5. Handle dampers using the frame or sleeve. Do not lift or move dampers using blades, actuator or jackshaft.

END OF SECTION

SECTION 23 3423

HVAC 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) - 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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Greenheck: www.greenheck.com.
- B. Loren Cook Company: www.lorencook.com.
- C. S&P.
- D. ACME Engineering and Manufacturing Corporation: www.acmefan.com.
- E. Carnes Company HVAC: www.carnes.com.

2.02 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.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Hung Cabinet Fans:
 - 1. Install fans with spring vibration isolators and flexible electrical leads.
 - 2. Install flexible connections specified in Section 23 3300 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 23 3700

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Diffusers.
- B. Registers/grilles.
- C. Louvers.

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.
- D. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.

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.
- B. Test and rate louver performance in accordance with AMCA 500-L.

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.
- G. Hart & Cooley

2.02 DIFFUSERS, REGISTERS, AND GRILLS - GENERAL

- A. Refer to schedules on drawings for quantities, types, finishes, and manufacturer's 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. Diffusers/Grilles 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.
- D. Coordinate frame types with architectural reflected ceiling plan.

2.03 LOUVERS

- A. Louvers shall be fabricated in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Fabricated of aluminum with at least 50% kynar/hynar.
- C. Provide color chart for selection by Architect/Owner.

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.
- E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 9000.

END OF SECTION

SECTION 23 8101

TERMINAL HEAT TRANSFER UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Unit 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. Indicate mechanical and electrical service locations and requirements.,
- C. Manufacturer's Instructions: Indicate installation instructions and recommendations.
- D. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valving.
- E. 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

2.02 UNIT HEATERS

- A. Finish: Factory applied baked enamel of standard color. Coordinate color with Architect.
- B. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.
- C. Air Outlet: Adjustable pattern diffuser on projection models and four way louvers on horizontal throw models.
- D. Motor: Permanently lubricated sleeve bearings on horizontal models, grease lubricated ball bearings on vertical models.
- E. Electrical Characteristics:
 - 1. Provide unit mounted disconnect. Provide resettable thermal overload protection for motor.

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. Unit Heaters: Hang from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

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.

END OF SECTION

SECTION 23 8113

PACKAGED TERMINAL AIR-CONDITIONERS (PVACs)

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Packaged Vertical Unitary Air Conditioners.
- B. Controls.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS

- A. Product Data: Provide data for manufactured products and assemblies. Indicate drain, ductwork, clearances, and electrical rough-in connections with electrical characteristics and connection requirements.
- B. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.
- C. 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. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 WARRANTY

- A. Provide a five year warranty to include coverage for refrigeration compressors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Magic-Pak.
- B. Other manufacturer's may be submitted as a voluntary alternate to the Base-Bid Magic-Pak.

2.02 AIR CONDITIONING UNITS

- A. Description: Packaged, self-contained, factory assembled, prewired unit, consisting of cabinet, compressor, condensing coil, evaporator fan, evaporator coil, discharge plenum, outside air connection, heating coil, air filters, and controls; fully charged with refrigerant and filled with oil.
- B. Assembly: Vertical flow air delivery, configuration as indicated.
- C. Energy Efficiency: Meet current energy code requirements.

2.03 CABINET

- A. Frame and Panels: Galvanized steel with baked enamel finish, easily removed access doors or panels with quick fasteners.
- B. Insulation: Minimum 1/2 inch thick lining cabinet interior.
- C. Primary & Secondary Drain Pan: corrosion-resistant coating.

2.04 EVAPORATOR FAN

- A. Fan: ECM direct drive fan.

2.05 COMPRESSOR

- A. Hermetically sealed, resiliently mounted with positive lubrication and internal motor protection.

2.06 EVAPORATOR COIL

- A. Direct expansion coiling coil of seamless copper or aluminum tubes expanded into aluminum fins.
- B. Refrigeration circuit with externally equalized thermal expansion valve, filter-drier, and charging valves.

2.07 CONDENSER

- A. Co-Axial, copper tube in copper tube or shell and tube with finned copper tubes in steel shell with water temperature actuated water regulating valve.
- B. Terminate suction and liquid refrigerant piping with service valves within unit.
- C. Fan: statically and dynamically balanced, with permanently lubricated bearings.

2.08 HEATING COIL

- A. Electric heating coil – Helix wound nichrome heating elements exposed directly in air stream. Cutoff limit control.

2.09 AIR FILTERS

- A. Easily removed 1-inch thick washable filters.

2.10 CONTROLS

- A. Factory wired controls shall include contactor, high and low pressure cutouts, internal winding thermostat for compressor, control circuit transformer, non-cycling reset relay.
- B. Provide thermostat to cycle cooling, mounted within unit with 'fan-off-cool' switch allowing continuous fan operation, or cycling fan on call for cooling.
- C. Provide low voltage, adjustable room thermostat to control heater stages in sequence with delay between stages, compressor, condenser, and supply fan to maintain temperature setting. Include system selector switch (off-heat-auto-cool), and fan control switch (auto-on).

2.11 ACCESSORIES/OPTIONS:

- A. Wall Sleeve.
- B. Architectural aluminum wall louver.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Pipe condensate from drain pan to nearest floor drain.

3.02 STARTING EQUIPMENT AND SYSTEMS

- A. The equipment manufacturer shall provide services of factory trained representative without additional charge to start the unit(s). Representatives shall provide start-up service for temporary construction use, final inspection and adjustment, and instruct OWNER on operation and maintenance.
- B. Demonstrate system operation and verify specified performance.

END OF SECTION

SECTION 26 0001

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 26 Specifications, AND applicable Division 28 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 26 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 their 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.
- D. The Contractor shall be held responsible for the complete and satisfactory accomplishment of all Work inclusive of whatever miscellaneous material and/or appurtenances are required to perfect the installation, and demonstrate that all electrical systems will operate satisfactorily under normal operating conditions.

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. The Contractor shall provide/install all electrical systems, and associated equipment, complete and include all necessary wire/conduit, pull boxes, and other components required due to interferences, space constraints, code requirements, etc. as required to provide a complete/functional system.
- B. These 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. E.C shall provide rough-in of box for T-stat/Sensor and conduit pathway from box to mechanical unit's control box, for wiring by M.C and/or T.C.. 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 conduits below, or with 45 degrees of the bottom corner of, foundation walls/footings. Coordinate with structural trades prior to rough-in.
 8. Verify & coordinate clearance requirements of all electrical and mechanical equipment/systems prior to the installation of any new work. Electrical equipment, lighting, conduit, systems, etc. shall not interfere with mechanical equipment spaces. 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, Plumbing, 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. RFIs must be submitted at least 5 working days prior to bid opening.

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 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.

1.07 CODES, PERMITS AND FEES

- A. Refer to Division 1, General Requirements and Supplementary Conditions.
- B. Unless otherwise indicated, all required permits, plan reviews, 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 latest enforceable rules and regulations set forth in local and state codes.
 - 1. Electrical systems shall be installed per current jurisdictional codes (i.e. Owner's Building Codes (International Building Codes, confirm Owner's current code to be followed), Michigan Electrical Codes, current NFPA codes (e.g. NFPA 72, etc.), and applicable sections of the Michigan Building Code.
- D. In the event that the plans and specifications conflict with any rules, regulations, or codes applying, said rules, regulations and codes shall govern.
- E. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.
- F. Contractor shall prepare any detailed drawings or diagrams which may be required by the governing authorities (i.e. fire alarm plans, etc.).

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 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 7 days prior to bid date. Substitutions submitted after this date will not be considered.

1.09 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 manufacture 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.

1.10 SHOP DRAWINGS

- A. Refer to Division 1, General Requirements.
- B. All shop drawings shall be submitted in groupings by specification section (i.e. 262416-Panelboards, 262726-Wiring Devices, etc.) and of similar and/or related items. Incomplete submittal groupings will be returned unchecked.
- C. Unless noted otherwise, submit electronically in digital .pdf form, 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. 26 2416 Panelboards
 - 2. 26 5100 Interior Lighting
 - 3. 26 5600 Exterior Lighting
 - 4. 28 3100 Fire Detection and Alarm

1.11 OPERATION AND MAINTENANCE INSTRUCTIONAL MANUALS

- A. Refer to Division 1, General Requirements.
- B. Provide complete maintenance and operating instructional manuals covering all electrical equipment as specified herein, and individual equipment specification sections.
- C. 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.
- D. 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. Panel A, Light Fixture type "S2", etc.).
- E. Internally subdivide the binder contents with permanent page dividers, organized by specification section and/or major equipment/systems (i.e. Fire Alarm, Transformers, Distribution Equipment, Wiring Devices, etc.).
- F. 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. Copies of Shop drawings and product data, approved by Architect/Engineer.
 - c. Installation and operational procedures.
 - d. Routine maintenance procedures.
 - e. Trouble shooting procedures.
 - f. Complete parts lists by nomenclature, manufacturer's part number and use.
 - g. Recommended spare parts lists.
 - h. Lubrication chart listing all types of lubricants to be used for each piece of equipment and the recommended frequency of lubrication.
 - i. Complete wiring and schematic diagrams.
 - j. 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. Warranty certificates.
 - b. Copies of approved construction permits.
 - c. Contractor's and equipment manufacturer's telephone numbers for warranty repair services.
- G. Two (2) Maintenance and Operating manuals shall be provided to the Architect and/or Engineer for review when construction is 75% complete.
- H. 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 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.
- 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.

1.13 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.

1.14 UTILITIES

- A. The Contractor shall be responsible for coordinating, obtaining service, and advising the Owner/Architect/Engineer, and utility company(s) for the electrical and telecom/TV service installations.

- B. 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 TV) and coordinate service requirements including, but not limited to, all transformers, meter boxes and meters which will be required.
- C. The Owner shall pay for any direct utility costs directly to the utility to be pulled in the Owner's name. The Contractor shall assist with coordinating the new electrical service and also provide for all installation costs in his bid including, but not limited to, conduit, transformer pads, mounting the CT/Meter, etc.
- D. In the event that the plans and specifications conflict with any utility rules applying, said utility rules and regulations shall govern.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All material and equipment furnished and installed by the Contractor for the permanent Work shall be new, unused, of the best quality of make specified, shall be free from defects of any character, and shall be listed as approved by the UL and/or FM.
- B. Outdoor electrical equipment shall be weatherproof, NEMA 3R or NEMA 4X (stainless steel), unless otherwise indicated.
- C. Unless otherwise specified in other Division 26 sections, the sheet metal surfaces of equipment enclosures shall be coated with a rust resisting primer. Over the primer, a corrosion resistant baked enamel finish shall be applied. The color shall be ASA No. 49, medium light gray.

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.

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. The Contractor shall perform all cutting, coring, and patching that may be necessary for the installation of their Work. All cutting, coring, patching and repair work shall be performed by the Contractor through qualified Subcontractors. Contractor shall include full cost of same in his bid.
- C. Secure approval from Architect and/or Structural Engineer, in writing, before cutting, welding/bolting to, or anchoring from any structural building components (i.e. structural steel, load bearing walls, footings/foundations, concrete floors/ceilings, etc.).

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. Refer to specification 078400-Firestopping.
- C. Provide adequate clearance to allow for proper sealing.
- D. 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.
- E. Sleeves placed in floors shall be flush with the underside of the floor construction and shall have planned, square ends, extending 2 inches above the finished floor, unless otherwise noted or detailed.
- F. 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.

3.08 FIRESTOP MATERIALS

- A. Refer to specification 078400-Firestopping.
- B. 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.
- C. 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.

3.09 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 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

3.12 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.

3.13 ACCESSIBILITY

- A. All equipment shall be installed so as to be readily accessible for operation, maintenance, and repair, as required by the equipment manufacturer and as subject to the approval of the Engineer.

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. Refer to Division 1, General Requirements.
- B. 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 26 0519

LOW-VOLTAGE ELECTRICAL POWER CABLES (600 V AND LESS)

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.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.03 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.

1.04 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, metal clad cable,
 - 1. On residential projects: Non-Metallic (NM) romex , SER/SEU cable may be used where allowed by code.
- 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.
 - 1. On residential projects: Non-Metallic (NM) romex , SER/SEU cable may be used where allowed by code. Must be supported so as not to be damaged upon accessing ceiling tiles.
- D. Exterior Locations: Use only building wire with Type THWN or XHHW insulation in raceway.
- E. Underground Installations: Use only building wire with Type THWN or XHHW insulation in raceway.
- F. Use stranded conductors for control circuits.
- G. Use conductor not smaller than 12 AWG for power and lighting circuits.
- H. Use conductor not smaller than 14 AWG for control circuits.
- I. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.

- J. Use 8 AWG conductors for 30 ampere, 120 volt branch circuits longer than 75 feet.
- K. Conductor sizes are based on copper unless indicated as aluminum or "AL".
- L. All feeders not sized on the plans shall be sized by the CONTRACTOR 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 CONTROL WIRING

- A. Control circuit, single conductor field wire shall be No. 14 AWG, stranded copper with 30 mil thick wall of cross linked polyethylene or polyvinyl chloride insulation rated to withstand a copper temperature of 90 degrees C. at 600 volts without deterioration. It shall meet applicable ICEA Standards.
- B. Multi conductor control cable shall consist of individual conductors, No. 14 AWG, stranded copper with 30 mil thick wall of insulation rated to withstand a copper temperature of 75 degrees C without deterioration. The insulation shall be a 20 mil wall of polyethylene with a 10 mil thick polyvinyl chloride jacket. The individual conductors shall be identified per Paragraph 5.6.3. of ICEA Publication No. S 61402 and shall be cabled together with suitable fillers and binder tape to give the completed cable a substantially circular cross section.

2.05 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.

2.06 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 exposed to damage 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. 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.
- R. Do not share neutral conductor on load side of dimmers.
- S. 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 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

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. Metal frame of the building.
 - 3. Concrete-encased electrode.
 - 4. Rod electrodes.

1.02 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.03 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 5 ohms.

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. American Electric.
- C. Chance.
- D. Burndy.
- E. 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. Chance.
 3. 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: #2/0 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 electrode conductor and connect to reinforcing steel in foundation footing. Bond steel together.
- C. Provide bonding to meet requirements described in Quality Assurance.
- D. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- E. 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.
- F. Where ground cables are installed in metallic conduit, the cables shall be bonded to the conduit at both ends of the run.
- G. Welds on ground cables shall be cleaned and painted with an asphalt base paint where buried underground or imbedded in concrete.
- H. 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.
- I. Circuits run in PVC conduit shall have a separate ground wire.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

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.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association.

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. Concrete Structural Elements: Use precast inserts, expansion anchors, or preset inserts.
 - 3. Steel Structural Elements: Use beam clamps or welded fasteners.
 - 4. Concrete Surfaces: Use expansion anchors.
 - 5. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use hollow wall fasteners.
 - 6. Solid Masonry Walls: Use expansion anchors or preset inserts.
 - 7. Sheet Metal: Use sheet metal screws.
 - 8. 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 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 off wall.
- E. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

SECTION 26 0534

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).
- B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT).
- C. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- D. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT); National Electrical Contractors Association.
- E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association.
- F. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association.
- G. NFPA 70 - National Electrical Code; National Fire Protection Association.

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.

1.04 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.
- C. Protect PVC conduit from sunlight.

1.05 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 nonmetallic 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 electrical metallic tubing.
 2. Exposed: Use galvanized rigid steel conduit or electrical metallic tubing.
- G. Transformer and Motor Connections:
1. Liquidtight flexible metal conduit (maximum length shall be 3'-0").
- H. 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.
- I. Control Wiring (fire alarm, 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. Wheatland Tube Company: www.wheatland.com.
 3. Century.
- B. Rigid Steel Conduit: ANSI C80.1. Galvanized Rigid Steel (GRS).
- C. 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.

2.06 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.

2.07 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. Fasten conduit supports to building structure and surfaces under provisions of Section 26 0529.
- G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- H. Arrange conduit to maintain headroom and present neat appearance.
- I. Route exposed conduit parallel and perpendicular to walls.
- J. Maintain adequate clearance between conduit and piping.
- K. Maintain 12 inch (300 mm) clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).
- L. Cut conduit square using saw or pipecutter; de-burr cut ends.
- M. Bring conduit to shoulder of fittings; fasten securely.
- N. 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.
- O. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations, and to cast boxes.
- P. 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.
- Q. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- R. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control, and expansion joints.
- S. Provide suitable pull string in each empty conduit except sleeves and nipples.
- T. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- U. Ground and bond conduit under provisions of Section 26 0526.
- V. Identify conduit under provisions of Section 26 0553.
- W. Underground exterior conduits shall be sloped away from the building at a minimum of 4" per 100' or 0.33%.
- X. Install insulating bushings at open ends of telephone, data, video, security, etc. conduits.
- Y. 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.

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 07 8400.
 - 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.

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 26 0537

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.
- B. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association.
- C. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association.
- E. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.03 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.
- B. Plastic Outlet Boxes may be used on residential projects where allowed by code.
- C. Wall Plates for Finished Areas: As specified in Section 26 2726.
- 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.

2.03 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Hinged Enclosures: As specified in Section 26 2716.

- C. 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.
- D. 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".
- E. 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 indicated on plans, minimum size 36"L x 24"W x 30"Deep. 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 Entrances: Pre-cut 4 x 4 inch cable entrance mouseholes at center bottom of each side.
 - 3. Cover: Glass fiber weatherproof cover with nonskid finish, stainless steel screws, and labeled "ELECTRIC".
 - 4. Provide all accessories (i.e top/bottom extensions, etc.) as required to accommodate conduit routings into/out of the handholes.
 - 5. Manufacturer:
 - a. Hubbell, Quazite.

PART 3 EXECUTION

3.01 EXAMINATION

- A. 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 26 2717.
- 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 26 2726.
- 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 (i.e. Panel LP-1).

- K. Install boxes to preserve fire resistance rating of partitions and other elements.
- 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. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- R. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- S. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- T. Use adjustable steel channel fasteners for hung ceiling outlet box.
- U. 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.
- V. 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.
- W. Use 2-gang 4" square boxes with single plaster rings for single device outlets.
- X. Use cast outlet box in exterior locations and wet locations.
- Y. Large Pull Boxes (boxes larger than 100 cubic inches in volume or 12 inches in any dimension):
Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other 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 26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Underground wiring tape.
- D. Panel schedules.

1.02 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association.

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 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.
- B. Seton Identification Products: www.seton.com/aec.
- C. Thomas & Betts.
- D. Panduit.

2.02 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 letters for identifying equipment and loads. Identification shall indicate where the load is fed from.

2.03 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, and junction boxes each load connection.
 - 1. Identify circuit feeder numbers at all wiring devices (receptacle, light switches, dimmers, etc.) with a self-adhesive wire marker taped to the back of the device cover plate.
- 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.

2.04 UNDERGROUND WARNING TAPE

- A. Description: 4 inch (100 mm) wide plastic tape, detectable type colored red with suitable warning legend describing buried electrical lines.

2.05 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.
- B. Existing panel schedules shall be improved to indicate all existing loads and/or updated to indicate all changes that have occurred during renovation. Typing over writing over existing entries on existing schedules is not acceptable. A new schedule shall be provided. Entries must be in type written form.

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.
- E. Identify all boxes for fire alarm circuits by painting cover plates red.

END OF SECTION

SECTION 26 2416

PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Lighting and appliance panelboards.
- B. 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.
- B. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; National Electrical Contractors Association.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- E. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association.
- G. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association.
- H. NFPA 70 - National Electrical Code; National Fire Protection Association.
- 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.

1.03 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.

1.04 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.

1.05 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.

1.06 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 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. BASE BID Square D, other approved manufacturers may only be bid as a voluntary alternate to the base bid and must be clarified in the bid as such.
- C. Siemens.

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: Refer to plans – Contractor shall verify AIC with local utility prior to ordering panelboards.
- D. Mains: Configure for top or bottom incoming feed as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. 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:
 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 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.
 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.03 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. Conductor Terminations:
 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
 2. Phase and Neutral Bus Material: Aluminum.
 - a. Provide double neutral bus where scheduled.
 3. Ground Bus Material: Aluminum.
 - a. Provide insulated ground bus where scheduled.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
 1. Provide surface-mounted or flush-mounted enclosures as indicated.
 2. Provide clear plastic circuit directory holder mounted on inside of door.
- F. Manufacturers:
 1. Square D QO type. BASE BID SQUARE D.
 2. Equal by approved manufacturer may be bid as alternate.
- G. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.
- H. Minimum Integrated Short Circuit Rating: As indicated on drawings or minimum as listed below.
 1. 208/240 Volt Panelboards: 14,000 amperes rms symmetrical.

- I. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type, with common trip handle for all poles; UL listed.
 - 1. Type SWD for lighting circuits.
 - 2. Type HACR for air conditioning equipment circuits.
 - 3. Class A ground fault interrupter circuit breakers where scheduled.
 - 4. Do not use tandem circuit breakers.
 - 5. Lock-on devices shall be provided for all branch circuits supplying exit lighting, un-switched night lighting, emergency lighting, security systems, clock and program systems, and/or fire alarm.
- J. Enclosure: NEMA PB 1, Type 1. (Type 3R for exterior locations).
- K. Cabinet Front: Flush or Surface (as noted on plans) cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

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:
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 - 3. Conductor Terminations:
 - a. 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.
 - 5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
 - 6. NOTE: All 120V, 15 – 20 amp, branch circuits feeding outlets or devices installed in dwelling units shall be protected by an Arc-Fault Circuit Interrupter (AFCI) protection, using AFCI rated breakers & outlets, in accordance with NEC 210.12.

PART 3 EXECUTION

3.01 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 26 0529.
- E. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

- F. 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.
- G. Provide grounding and bonding in accordance with Section 26 0526.
- H. Install all field-installed branch devices, components, and accessories.
- I. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.
- J. Install panelboards plumb. Install recessed panelboards flush with wall finishes.
- K. 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.
- L. Provide filler plates to cover unused spaces in panelboards.
- M. 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.
- N. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- O. Provide identification nameplate for each panelboard in accordance with Section 26 0553.
- P. Provide arc flash warning labels in accordance with NFPA 70.

3.02 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.
- C. NOTE: All 120V, 15 – 20 amp, branch circuits feeding outlets or devices installed in dwelling units shall be protected by an Arc-Fault Circuit Interrupter (AFCI) protection, using AFCI rated breakers & outlets, in accordance with NEC 210.12.

3.03 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.

END OF SECTION

SECTION 26 2701

ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metering transformer cabinets.
- B. Meter bases.
- C. Contractor shall arrange with Utility Company for permanent electrical service. Contractor shall be responsible for providing drawings to the Utility Company for Coordination of services and charges. Contractor shall provide conduit for primary cable from service to transformer, transformer pad (if pad mounted), and installation of meter base per utility requirements. Owner shall pay for any direct utility costs for new or modified service charges.

1.02 REFERENCE STANDARDS

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.03 SYSTEM DESCRIPTION

- A. Service Entrance: Either Overhead or Underground service entrance, as coordinated with and determined by the Electrical Utility.

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 four (4) weeks prior to commencing work of this section. Review service entrance requirements and details with Utility Company representative at least eight (8) weeks prior to start of new electrical service.

PART 2 PRODUCTS

2.01 COMPONENTS

- A. Meter Base: Furnished by utility company.
- B. Utility Transformer Pad: Prefabricated precast concrete transformer pad with cable pit.
- C. 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 and for Coordination of the new service or modifications to existing service.
- 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 securely, in a neat and workmanlike manner, as specified in NECA 1.

END OF SECTION

SECTION 26 2717

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.
- B. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association.

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 26 2818, 26 2913 and in individual equipment sections.
- C. Wiring Devices: As specified in Section 26 2726.
- D. Flexible Conduit: As specified in Section 26 0534.
- E. Wire and Cable: As specified in Section 26 0519.
- F. Boxes: As specified in Section 26 0537.

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 interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 26 2726

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.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F.
- C. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- D. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association.
- E. NEMA WD 6 - Wiring Device - Dimensional Requirements; National Electrical Manufacturers Association.
- F. NFPA 70 - National Electrical Code; National Fire Protection Association.
- 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 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.03 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.

1.04 EXTRA MATERIALS

- A. Furnish two of each style/size of wiring device and finish wall plate.

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 ALL WIRING DEVICES

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.03 WALL SWITCHES

- A. 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.
- B. Wall Switches: NEMA WD 1, General Duty, Spec. Grade, AC only general-use snap switch. Switches shall be binding screw type, side and back wired type.
 - 1. Body and Handle: Ivory plastic with toggle handle. Coordinate color selection with Architect prior to ordering.
 - 2. Ratings: Match branch circuit and load characteristics.
- C. Single Pole Single Throw Wall Switches
 - 1. Products:
 - a. Hubbell 1221.
 - b. Arrow Hart 1991.
 - c. Leviton 1221.
- D. Three Way Wall Switches
 - 1. Products:
 - a. Hubbell 1223.
 - b. Arrow Hart 1993.
 - c. Leviton 1223.
- E. Four Way Wall Switches
 - 1. Products:
 - a. Hubbell 1224.
 - b. Arrow Hart 1994.
 - c. Leviton 1224.
- F. Double Pole Single Throw Wall Switches
 - 1. Products:
 - a. Hubbell 1222.
 - b. Arrow Hart 1992.
 - c. Leviton 1222.

2.04 WALL DIMMERS

- A. All Wall Dimmers: Solid-state with continuous full-range even control complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472.
 - 1. Types and ratings suitable for load controlled as indicated on the drawings.
- B. Wall Dimmers: Type I, complying with NEMA WD 6 and WD 1. Preset slide controls, Single pole or 3-way as shown on plans, with LED locator.
- C. Manufacturers:

1. Hubbell.
 2. Lutron.
 3. Leviton.
- D. Body and Handle: Ivory plastic with preset linear slide. Coordinate color selection with Architect prior to ordering.
- E. Voltage: Match lighting circuit voltage volts.
- F. Power Rating: Match load shown on drawings; 600 watts minimum.
- G. Note: For LED type light fixtures, Contractor shall provide dimmer type compatible with LED type fixtures being controlled by the dimmer.
- H. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

2.05 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. Receptacles: NEMA WD 1, General duty, Spec. Grade, grounded type
1. Configuration: NEMA WD 6, type as specified and indicated.
- C. 20 Amp Duplex Convenience Receptacles.
1. Hubbell 5362.
 2. Arrow Hart 5362.
 3. Leviton 5362.
 4. Device Body: Ivory; Coordinate color selection with Architect prior to ordering. All devices on emergency circuits shall be red in color.
 5. NOTE: All 120V, 15 – 20 amp, branch circuits feeding outlets or devices installed in dwelling units shall be protected by an Arc-Fault Circuit Interrupter (AFCI) protection, using AFCI rated breakers & outlets, in accordance with NEC 210.12.
- D. 20 Amp GFCI Receptacles: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.
1. Hubbell.
 2. Arrow Hart.
 3. Leviton.
 4. Device Body: Ivory. Coordinate color selection with Architect prior to ordering. All devices on emergency circuits shall be red in color.
 5. GFCI receptacles shall meet UL 2003 standards.
- E. 30 Amp, 120/240V (NEMA 10-30R) Receptacles.
1. Hubbell 9350 series or equal by Arrow Hart or Leviton.
- F. 50 Amp, 120/240V (NEMA 10-50R) Receptacles.
1. Hubbell 7962 series or equal by Arrow Hart or Leviton.

2.06 WALL PLATES

- A. All Wall Plates: Comply with UL 514D.
 - 1. Configuration: One-piece cover as required for quantity and types of corresponding wiring devices.
 - 2. Screws: Metal with slotted heads finished to match wall plate finish.
- B. Interior wall plates:
 - 1. Standard thermoplastic cover plates: Colors to match device colors.
- C. Exterior wall plates:
 - 1. Weatherproof Cover Plates (where located outdoors and where indicated on plans as "WP"): Raintight/gasketed, clear impact resistant thermoplastic, spring retained cover with offset device opening for cord exit.

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 wall openings are neatly cut and will be completely covered by 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 wiring devices.
- F. Verify that openings in access floor are in proper locations.
- G. Verify that conditions are satisfactory for installation prior to starting work.
- H. 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 26 0537 as required for installation of wiring devices provided under this section.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. 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.
- E. 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.
- F. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- G. Install wiring devices plumb and level with mounting yoke held rigidly in place.

- H. Install wall switches with OFF position down.
- I. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- J. Do not share neutral conductor on branch circuits utilizing wall dimmers.
- K. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- L. 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.
- M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- N. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
- O. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.04 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate locations of outlet boxes provided under Section 26 0537 to obtain mounting heights indicated on drawings.
- B. Install wall switches, dimmers, motor control switches at 50 inches to center of box above finished floor. For CMU walls - 48" to top of box above finished floor.
- C. Install convenience receptacles 18 inches (450 mm) above finished floor to center of box (not otherwise specified).
- 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 rooms, janitor closets, 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. Install fire alarm horns, strobes, speakers at 96 inches above floor (to top of box) or 6 inches below ceiling, whichever is less. But no lower than 80" above finish floor.
- I. Coordinate all finishes and colors of wiring devices with Architect prior to ordering.
- J. Coordinate mounting height/locations with Architect 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. Test each receptacle to verify operation and proper polarity.
- D. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- E. Correct wiring deficiencies and replace damaged or defective wiring devices.
- F. NOTE: All 120V, 15 – 20 amp, branch circuits feeding outlets or devices installed in dwelling units shall be protected by an Arc-Fault Circuit Interrupter (AFCI) protection, using AFCI rated breakers & outlets, in accordance with NEC 210.12.

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 26 2813

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.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association.
- C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

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 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 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. Main Service Switches Larger than 600 amperes: Class L (time delay).
- H. Main Service Switches: Class RK1 (time delay).
- I. Power Load Feeder Switches Larger than 600 amperes: Class L (time delay).
- J. Power Load Feeder Switches: Class RK1 (time delay).
- K. Motor Load Feeder Switches: Class RK1 (time delay).

- L. Other Feeder Switches Larger than 600 amperes: L time delay.
- M. Other Feeder Switches: Class RK1 (time delay).
- N. General Purpose Branch Circuits: Class RK1 (time delay).
- O. Motor Branch Circuits: Class L time delay.

PART 3 EXECUTION

3.01 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 26 2818

ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fusible switches.
- B. Nonfusible switches.

1.02 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- B. NEMA FU 1 - Low Voltage Cartridge Fuses; National Electrical Manufacturers Association.
- C. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association.
- D. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- B. Project Record Documents: Record actual locations of enclosed switches.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. General Electric Company: www.geindustrial.com.
- B. Schneider Electric; Square D Products: www.schneider-electric.us. BASE BID Square D, other approved manufacturers may only be bid as a voluntary alternate to the base bid and must be clarified in the bid as such.
- C. Siemens.

2.02 COMPONENTS

- A. Fusible Switch Assemblies: 30 thru 600A, NEMA KS 1, Type HD quick-make, quick-break, enclosed load interrupter knife switch.
 - 1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
 - 2. Handle lockable in OFF position.
 - 3. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses.
- B. Nonfusible Switch Assemblies: NEMA KS 1, Type HD quick-make, quick-break, enclosed load interrupter knife switch.
 - 1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
 - 2. Handle lockable in OFF position.
- C. Enclosures: NEMA KS 1.

1. Interior Dry Locations: Type 1.
2. Exterior Locations: Type 3R or 4x.

PART 3 EXECUTION

3.01 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 26 0529.
- 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 26 0526.
- H. Provide identification nameplate for each enclosed switch in accordance with Section 26 0553.
- I. Install fuses in fusible disconnect switches.
- J. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

END OF SECTION

SECTION 26 5100

INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.

1.02 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- B. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association.
- C. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; National Electrical Contractors Association.
- D. NFPA 70 - National Electrical Code; National Fire Protection Association.
- E. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association.
- F. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.03 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.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70 and NFPA 101.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.

1.06 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/Lithonia Lighting.
- B. Eaton/Cooper Lighting.
- C. Hubbell Lighting.
- D. Or as noted in lighting schedule on the drawings.

2.02 LUMINAIRES

- A. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- B. Provide products that comply with requirements of NFPA 70 and NFPA 101.
- C. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- D. Unless otherwise indicated, provide complete luminaires including LED light source, lamp(s) and all sockets, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. 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.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

2.03 LUMINAIRES

- A. Furnish products as indicated in Schedule included on the Drawings.

2.05 LAMPS

- A. All LED light sources or 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.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 0537 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. Install suspended luminaires using pendants supported from swivel hangers (except where noted to use chain hangers). Provide pendant length required to suspend luminaire at indicated height.
- F. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
- G. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- H. Install recessed luminaires to permit removal from below.
- I. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- J. Install wall mounted luminaires at height as indicated on Drawings or in Architectural plans.
- K. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture; use flexible conduit.
- L. Connect luminaires to branch circuit outlets provided under Section 26 0537.
- M. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- N. Bond products and metal accessories to branch circuit equipment grounding conductor.

3.02 FIELD QUALITY CONTROL

- A. Inspect each product for damage and defects.
- B. Operate each luminaire after installation and connection to verify proper operation.

3.03 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.

3.04 SCHEDULE - See Drawings

END OF SECTION

SECTION 26 5600

EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior luminaires.

1.02 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- B. NECA/IESNA 501 - Recommended Practice for Installing Exterior Lighting Systems.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association.
- D. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.03 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.
- C. Test Reports: Indicate measured illumination levels.
- 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.

1.04 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 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.

1.05 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.

1.06 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. Eaton/Cooper Lighting Group.
- B. Acuity/Lithonia.
- C. Hubbell Lighting Group Products.
- 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. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- D. Unless otherwise indicated, provide complete luminaires including LED light sources, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. 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.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Coordinate locations of outlet boxes provided under Section 26 0537 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. Install accessories furnished with each luminaire.
- F. Bond products and metal accessories to branch circuit equipment grounding conductor.
- G. Install lamps in each luminaire.
- H. Bond luminaires, metal accessories, and metal poles to branch circuit equipment grounding conductor. Provide supplementary grounding electrode at each pole.

3.02 FIELD QUALITY CONTROL

- A. Inspect each product for damage and defects.
- B. Operate each luminaire after installation and connection to verify proper operation.
- C. Correct wiring deficiencies and repair or replace damaged or defective products.
- D. Measure illumination levels to verify conformance with performance requirements. Take measurements during night sky, without moon or with heavy overcast clouds effectively obscuring moon.

3.03 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.

3.04 SCHEDULE - See Drawings

END OF SECTION

SECTION 28 3100

FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire alarm system design and installation, including all components, wiring, and conduit.

1.02 REFERENCE STANDARDS

- A. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
- B. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low-Voltage Power Circuits.
- C. NFPA 70 - National Electrical Code.
- D. NFPA 72 - National Fire Alarm Code and Signaling Code.
- E. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
- F. Applicable Building Codes. Coordinate & Confirm Owner's current applicable building code.

1.03 SUBMITTALS

- A. Drawings shall be prepared as .DWG / .DXF-format CAD drawings.
 - 1. OWNER will provide floor plan drawings.DWG / .DXF-format CAD for CONTRACTOR's use; verify all dimensions on OWNER-provided drawings.
- B. Evidence of designer qualifications, if requested.
- C. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
 - 1. Copy (if any) of list of data required by authority having jurisdiction.
 - 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
 - 4. System zone boundaries and interfaces to fire safety systems.
 - 5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
 - 6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
 - 7. List of all devices on each signaling line circuit, with spare capacity indicated.
 - 8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
 - 9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
- D. Evidence of installer qualifications, if requested.
- E. Evidence of maintenance contractor qualifications, if requested.
- F. Operating and Maintenance Data: Revise and resubmit until acceptable; have one set available during closeout demonstration:

1. Original copy of NFPA 72 with portions that are not relevant to this project neatly crossed out by hand; label with project name and date.
 2. Complete set of specified design documents, as approved by authority having jurisdiction.
 3. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
 4. Contact information for firm that will be providing contract maintenance and trouble call-back service.
 5. List of recommended spare parts, tools, and instruments for testing.
 6. Replacement parts list with current prices, and source of supply.
 7. Detailed troubleshooting guide and large scale input/output matrix.
 8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.
- G. Project Record Documents: Have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
 2. "As installed" wiring and schematic diagrams, with final terminal identifications.
 3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- H. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with his installation requirements, is complete, and is in satisfactory operating condition.
 2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
 3. Certificate of Occupancy.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, CONTRACTOR, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.
- B. Installer Qualifications: Firm with minimum 5 YEARS documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
 2. Installer Personnel: At least 3 YEARS of experience installing fire alarm systems.
 3. Certified in as fire alarm installer.
- C. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

1.05 WARRANTY

- A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.

- B. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

1.06 GENERAL REQUIREMENTS

- A. Refer to 260001 - General Electrical Requirements for general requirements of this specification section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Alarm Control Units - Other Acceptable Manufacturers: Provided their products meet or exceed the performance of the basis of design product, products of the following are acceptable:
 - 1. Honeywell Security & Fire Solutions/Notifier: www.notifier.com.
 - 2. SimplexGrinnell: www.simplexgrinnell.com.
 - 3. Edwards System Technology.
 - 4. Provide all control units made by the same manufacturer.
- B. Initiating Devices, and Notification Appliances:
 - 1. Same manufacturer as control units.
 - 2. Provide all initiating devices and notification appliances made by the same manufacturer.

2.02 FIRE ALARM SYSTEM

- A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
 - 1. Provide design and installation of all components/wiring/conduit/etc. necessary to provide a complete/functional system per NFPA 72. The contract documents are diagrammatical in nature and should not be used or bid as detailed design drawings. The fire alarm contractor shall provide any/all design and construction required for the entire fire alarm system and bid the project as such.
 - 2. Protected Premises:
 - a. Entire building shown on drawings.
 - b. Supervise & Alarm Fire Suppression Sprinkler system, coordinate requirements with Fire Suppression Sprinkler system subcontractor.
 - 3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
 - a. The Americans With Disabilities Act (ADA).
 - b. The requirements of the local authority having jurisdiction.
 - c. Applicable local codes, coordinate/confirm Owner's (Little Traverse Bay Band of Odawa Indians) current code.
 - d. The contract documents (drawings and specifications).
 - e. NFPA 101.
 - f. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
 - g. Local Fire Department/Authority requirements.
 - 4. Evacuation Alarm: Multiple smoke zones; Smoke Detectors in each APARTMENT shall alarm all the other Smoke Detectors in that APARTMENT.

5. Hearing Impaired Occupants: Provide visible notification devices in all public areas and in dwelling units.
 6. Fire Command Center: Location indicated on drawings.
 7. Fire Alarm master Control Unit (FACP): New, located at fire command center.
 8. Provide dialer and connection to phone system for supervision by Fire Department / Fire Authority.
- B. Circuits:
1. Initiating Device Circuits (IDC): Class B, Style C.
 2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 4.
 3. Notification Appliance Circuits (NAC): Class B, Style Y.
 4. All circuits shall be installed in conduit.
- C. Spare Capacity:
1. Initiating Device Circuits: Minimum 25 percent spare capacity.
 2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
 3. Fire Alarm Master Control Unit (FACP): Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.
- D. Power Sources:
1. Primary: Dedicated branch circuits of the facility power distribution system.
 2. Secondary: Storage batteries.
 3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.

2.03 FIRE SAFETY SYSTEMS INTERFACES

- A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
1. Sprinkler water control valves, flow switches, etc..
 2. Dry-pipe sprinkler system pressure, flow switches, etc..
 3. Dry-pipe sprinkler valve room low temperature?.
- B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
1. Sprinkler water flow.

2.04 COMPONENTS

- A. General:
1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
 2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
 3. Drawings are diagrammatic and indicate the general scope of work. Provide design and installation of all initiating devices, notification appliances, circuits, etc. required for a complete/functional system per NFPA 72, Life Safety Code, and applicable building codes, whether accurately shown on the drawings or not.
- B. Fire Alarm Master Control Unit (FACP), Initiating Devices, and Notification Appliances: Addressable Type; listed by Underwriters Laboratories as suitable for the purpose intended.
- C. Initiating Devices:

1. Manual Pull Stations.
 2. Smoke Detectors.
 3. Heat Detectors.
 4. Addressable Interface Devices.
- D. Notification Appliances:
1. Horn/Strobes: All horn/strobes shall have field adjustable candela options of 15, 30, 75, 95, and 110 candela.
 2. Strobes: All strobes shall have field adjustable candela options of 15, 30, 75, 95, and 110 candela.
- E. Circuit Conductors: Copper or optical fiber; provide 200 feet (60 m) extra; color code and label.
- F. Provide weatherproof devices in wet/damp locations (i.e. outdoors)
- G. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
1. Equipment Connected to Alternating Current Circuits: Maximum let through voltage of 350 V(ac), line-to-neutral, and 350 V(ac), line-to-line; do not use fuses.
- H. Locks and Keys: Deliver keys to OWNER.
1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type
- I. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
1. Provide one for each control unit where operations are to be performed.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and the contract documents.
- B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- C. Obtain OWNER's approval of locations of devices, before installation.
- D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

- A. Notify OWNER 7 days prior to beginning completion inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- E. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

3.03 OWNER PERSONNEL INSTRUCTION

- A. Provide the following instruction to designated OWNER personnel:
 1. Hands-On Instruction: On-site, using operational system.

- B. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
 - 1. Initial Training: 1 session pre-closeout.

3.04 CLOSEOUT

- A. Closeout Demonstration: Demonstrate proper operation of all functions to OWNER.
 - 1. Be prepared to conduct any of the required tests.
 - 2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
 - 3. Have authorized technical representative of control unit manufacturer present during demonstration.
 - 4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
 - 5. Repeat demonstration until successful.
- B. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
 - 1. Approved operating and maintenance data has been delivered.
 - 2. All aspects of operation have been demonstrated to OWNER.
 - 3. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
 - 4. Occupancy permit has been granted.
 - 5. Specified pre-closeout instruction is complete.
- C. Perform post-occupancy instruction within 3 months after Substantial Completion.

END OF SECTION

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 01 5713: Temporary Erosion and Sediment Control
- B. Section 01 8900: 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 01 5713, 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 01 8900, 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 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 01 5713: Temporary Erosion and Sediment Control
- B. Section 01 8900: Site Construction Performance Requirements
- 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

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 01 5713, 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 01 8900 Site 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 01 5713: Temporary Erosion and Sediment Control
- B. Section 01 8900: Site Construction Performance Requirements
- C. Section 31 1100: Clearing and Grubbing
- D. Section 31 3500: Slope Protection
- E. Section 31 2319: Dewatering
- F. Section 32 9219: Seeding

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, Standard Specifications for Construction, latest edition

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 yd² (1 m²) 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 01 5713, 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)
CBR Puncture Strength	ASTM D6241	900 lbs. (min)
Apparent Opening Size	ASTM D4751	40 – 70 U.S. Sieve
Permittivity	ASTM D4491	0.05 per sec (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 CONTRACTOR, 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 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 or base course is required, shall be trimmed to the established grade within ± 0.1 foot (30 mm). Where a subbase or base course is not required, the subgrade shall be trimmed to the established grade within $\pm 3/4$ 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.

- c. 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 01 5713: Temporary Erosion and Sediment Control
- B. Section 01 8900: Site Construction Performance Requirements
- C. Section 31 1100: Clearing and Grubbing
- D. Section 31 2200: Grading
- E. Section 31 2319: Dewatering
- F. Section 32 9219: Seeding
- G. Section 33 1100: Water Utility Distribution Piping
- H. Section 33 3000: Sanitary Utility Sewerage Piping
- 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, Standard Specifications for Construction, latest edition

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 01 5713, 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. 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.

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 01 8900, 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 m³) 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 01 8900, 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 01 5713: Temporary Erosion and Sediment Control
- B. Section 01 8900: Site Construction Performance Requirements
- C. Section 31 2316: Structural Excavation and Backfill
- D. Section 31 2333: Trenching and Backfilling

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 01 5713: Temporary Erosion and Sediment Control
- B. Section 01 8900: Site Construction Performance Requirements
- 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 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, Standard Specifications for Construction, latest edition

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 01 5713, 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 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/m³); 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/m³) min
 - 2. Cement: 70 lbs/c.y. (40 kg/m³) min
 - 3. Water: Sufficient water to produce desired flowability, 700 lbs/c.y. (415kg/m³) ±
- 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 "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.
 2. 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.
- 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 01 5713: Temporary Erosion and Sediment Control
- B. Section 01 8900: Site Construction Performance Requirements
- C. Section 32 9219: Seeding

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, 2012 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 01 5713, 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/m³); 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 m²) 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/m³) 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 in ² (.225 m ²)
5.	Area, Upper Surface.....	95 in ² (600 cm ²)
6.	Area, Base Surface.....	326 in ² (2100 cm ²)
7.	Bearing Capacity.....	100 lb./sq.ft. (490 kg/m ²)
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/m ²)
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 in² (400 cm²)
2. 50% Approximately 144 in² (925 cm²)
3. 25% Approximately 324 in² (2100 cm²)

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/m²) 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/m²) 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 m²) 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 01 8900: Site Construction Performance Requirements
- B. Section 31 2313: Subgrade Preparation
- C. Section 32 1216: Bituminous 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, Standard Specifications for Construction, latest edition

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 Series 21 and 22, as specified in MDOT, Section 902.

2.02 Calcium Chloride Additives

- A. Calcium chloride additives shall conform to ASTM D98 and as specified in MDOT, Section 903.

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 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. Lane width shall be as indicated on the Contract Drawings or as determined by ENGINEER.
 - 1. If 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 m²) 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 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 01 8900: 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, Standard Specifications for Construction, latest edition

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 Section 501, 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 501 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/m²).

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/m²) 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/m²) on the bituminous or concrete foundation and between 0 and 0.05 gallons per square yard (0 to 250 ml/m²) 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 501.

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/m²), 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 m²) 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 °F (°C)	Rate of Application of Bituminous Material, lbs/syd (kg/m³)		
	< 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 1 or more applications of bituminous material applied to the prepared surface and 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 MDOT 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 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 2 to 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 502, 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/m²).

- 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.

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
<p>Notes:</p> <p>(1) 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.</p> <p>(2) This includes all sieve sizes No. 4 (4.75 mm) and larger listed on the Job Mix Formula.</p>						

Table A¹: Composition of Mixtures

Mixture No.	Total Percent Passing Indicated Sieve (a)										No. 700 No. 500 (20C)	
	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. 900 (20A)	No. 900 (20B)		
1-1/2" (37.5 mm)	-	-	-	-	-	-	-	-	-	-	-	100
1" (25 mm)	-	-	-	-	-	-	-	-	-	-	-	80-100
3/4" (19 mm)	-	100	-	100	100	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	60-90	60-95	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	40-65	40-70	40-70	30-55
No. 30 (600 um)	25-50	20-5	25-50	20-45	20-40	20-45	20-40	20-45	20-40	20-45	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	3-10	3-10	3-10
Binder % (c)	5-9	5-9	5-9	5-7	5-7	5-7	5-7	5-8	5-8	5-8	5-8	3-6
Crushed Min. %	(d)	60	(d)	40	25	40	25	-	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%

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

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, Standard Specifications for Construction, latest edition

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/m³); 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.

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, A616-96a, or A617-96a. Hook bolts shall be 5/8 inch (16 mm) diameter.

2.07 Joint Sealant

- A. Hot-poured type joint sealant shall conform to ASTM D6690 Type II and as specified in MDOT Section 914.

2.08 Concrete Mix

- A. Concrete shall contain a minimum of six sacks, 94 pounds per sack, of cement per cubic yard (335 kg/m³) 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/m³).
- 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).
- B. 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.
- C. 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.
- D. 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 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 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 m²) 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"	None
by more than a 1/4", but not exceeding a 1/2"	20
by more than a 1/2", but not exceeding 1"	50
by more than 1"	Remove & Replace

Compressive Strength	
Under Required Compressive Strength	Percent of Reduction in Unit Price
0 to 150 psi	None
by more than 150 psi, but not exceeding 300 psi	20
by more than 300 psi, but not exceeding 500 psi	50
by more than 500 psi	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 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, Standard Specifications for Construction, latest edition

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 Polyurea Pavement Markings

- A. Two-component, polyurea 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 922.06.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 920.02 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 Polyurea Pavement Markings

- A. Polyurea pavement markings shall not be applied over existing non-polyurea pavement markings. Existing non-polyurea 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 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 01 8900: Site Construction Preparation 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, 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 (P₂O₅) and total available Potash (K₂O) 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, latest edition

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						
Kind	Seeds		Mixture Proportions (%)			
	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	Freeway, Blvds, 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 \pm 1-inch (900m m \pm 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) \pm 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 law.

- B. 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.
- C. 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.
- D. 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/m ³ |
| 11. | Moisture Content..... | 40 to 50 % |
| 12. | Particle Size..... | < 20 mm maximum |
| 13. | Water Holding Capacity..... | > 100% |
| 14. | Heavy Metals..... | None |
- E. Maturity/Stabilization: An acceptable test that can demonstrate Maturity/Stability.
- F. 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.
- G. 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.
- H. 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.
- I. A data sheet shall accompany the certification.
- J. 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
- K. 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, \pm 1-inch (100 mm \pm 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/m²). 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/m²). 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 cm²) 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 33 0513 Manholes and Structures

Part 1 General

1.01 Scope of Work

- A. This Section includes Monolithic concrete manholes with lid frame, covers, anchorage and accessories, as well as modular precast concrete manhole sections with tongue-and-groove joints with masonry transition to lid frame, covers, anchorage and accessories.

1.02 Related Work Specified Elsewhere

- A. Section 31 2316: Structural Excavation and Backfill
- B. Section 31 2319: Dewatering
- C. Section 31 2333: Trenching and Backfilling

1.03 Requirements of Regulatory Agencies

- A. Conform to the applicable requirements of State and local health authorities having jurisdiction for disinfection and testing of water mains.

1.04 Reference Standards

- A. Unless otherwise specified, the Work of this Section shall conform to the applicable portions of the following Standard Specifications:
 - 1. ACI - American Concrete Institute
 - 2. ASTM - ASTM International

1.05 Submittals

- A. Shop Drawings: Indicate manhole and vault locations, elevations, piping, conduit, and sizes and elevations of penetrations.
- B. Product Data: Provide manufacturer's data and installation instructions for precast manhole and vault sections, joint connections, water stops, gaskets, corrosion protection system, flexible pipe joints, chimney seals, manhole and vault castings, and other pertinent information for precast and cast-in-place manholes and vaults.
- C. Manufacturers Certification: Certify that all products furnished meet or exceed the specified requirements, including worst case depth loadings for this project.
- D. Calculations: Submit calculations for review sealed and signed by a registered Professional Structural Engineer in the State of Michigan. Include structural, depth of bury, buoyancy, and all other information necessary to determine adequacy of the item.
- E. Results of manhole and vault leakage and vacuum tests

1.06 Closeout Submittals

- A. The following shall be submitted in accordance with Section 01 7700, Closeout Procedures:
 - 1. Manufacturer's field reports.
 - 2. Project record documents:
 - a. Accurately record actual locations of manholes, connections, and invert elevations.
 - b. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.07 Design Requirements

- A. Equivalent strength: Based on structural design of reinforced concrete as outlined in ACI 318.
- B. Design of Lifting Devices for Precast Structures: In accordance with ASTM C 890 "Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures." Provide lifting inserts designed for four times the anticipated lifting load. Grout inserts in place when complete.
- C. Design of Joints for Precast Structures: Gaskets in accordance with ASTM C 923 "Standard Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals" with maximum leakage of 0.025 gallons per hour per foot of joint at 3 feet of head.
- D. Use precast concrete manholes or vaults designed by the precast manufacturer's registered Professional Structural Engineer, licensed in the State of Michigan in accordance with the Contract Documents. Furnish precast concrete manholes, however, conforming to the following minimum design requirements in addition to the ASTM standards referenced in this Section:
- E. The top slab of all manholes or vaults shall be designed for an H-20 truck loading.
- F. Minimum manhole or vault base slab thickness shall be eight (8) inches up to twenty five (25) feet depth and twelve (12) inches over twenty five (25) feet depth.
- G. Manholes and vaults shall resist buoyancy due to flooding with a high ground water table elevation at the top of the precast concrete structure. The factor of safety against buoyancy shall be 1.20. Buoyancy calculations shall be provided with the submittal.
- H. Walls backfilled with cohesive soil shall be designed for an equivalent horizontal fluid at-rest soil pressure of 135 pounds per square foot (psf) per foot of wall height for walls below the ground water table.
- I. Walls backfilled with granular soil shall be designed for an equivalent horizontal fluid at-rest soil pressure of 125 psf per foot of wall height for walls below the ground water table.
- J. Design walls for surcharge load from adjacent structures or minimum 300 psf surcharge, whichever is greater.
- K. Loads associated with testing manholes and vaults for water-tightness by vacuum testing in accordance with this Section.

1.08 Delivery, Storage and Handling

- A. Comply with precast concrete manufacturer's instructions for unloading, storing and moving precast manholes, vaults and drainage structures.
- B. Store precast concrete manholes, vaults and drainage structures to prevent damage to Owner's property or other public or private property. Repair property damaged from materials storage.
- C. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Contract Drawings to indicate its intended use.

1.09 Qualifications

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

Part 2 Products

2.01 Valve Vaults, Manholes, Frames, and Covers

- A. Valve Vaults and Manhole Manufacturers:
 - 1. Northern Concrete Pipe, Inc.
 - 2. Mack Industries
 - 3. ENGINEER-approved equal.
- B. Manhole and Vault Sections: Reinforced precast concrete in accordance with ASTM C478 with gaskets in accordance with ASTM C923.
- C. Benching:
 - 1. Provide full height and poured-in-place benching.
 - 2. Use non-shrink grout as specified in Section 04 0511.
 - 3. Appropriate granular filler may be used, subject to the approval of Engineer.
- D. Watertight Cover and Frame Manufacturers:
 - 1. East Jordan Iron Works, Inc. - Model 1040 ZPT, Type A.
 - 2. Neenah Foundry Co. - Model R-1916-F.
 - 3. ENGINEER-approved equal.
- E. Cover and Frame Product Description:
 - 1. ASTM A48, Class 35B Cast iron construction, machined flat bearing surface, removable, watertight, and boltable lid, 304 stainless steel frame anchors with non-seizing 304 stainless steel nuts, 304 stainless steel bolts for cover, and a cover molded with name and logo per Contract Drawings.

2.02 Storm Sewer Manholes, Frames, and Covers

- A. Storm Sewer Manhole Manufacturers:

1. Northern Concrete Pipe, Inc.
 2. Mack Industries
 3. ENGINEER-approved equal.
- B. Cover and Frame Manufacturers:
1. East Jordan Iron Works, Inc. - Model 1040 ZPT, Type A.
 2. Neenah Foundry Co. - Model R-1916-F.
 3. ENGINEER-approved equal.
- C. Cover and Frame Product Description:
1. ASTM A48, Class 35B Cast iron construction, machined flat bearing surface, removable, watertight, and boltable lid, 304 stainless steel frame anchors with non-seizing 304 stainless steel nuts, 304 stainless steel bolts for cover, and a cover molded with name and logo per Contract Drawings.

2.03 Other Manhole and Vault Components

- A. Steps: Per Contract Drawings.
- B. Base Slab:
1. Per Contract Drawings, cast-in-place concrete of type specified in Section 03301 or integral, monolithically cast precast concrete or standard tee pipe base sections.
- C. Pipe to Manhole/vault Connection:
1. Unless noted otherwise on the Contract Drawings, use a resilient type connector, in accordance with ASTM C-923, to connect pipes to the manhole. Use an A-Lock press wedge, Kor-n-Seal, or Res-Seal connector. No substitutions will be allowed. Non-shrink grout may only be used per the Contract Drawings or with written permission of the Engineer.
- D. Manhole and Vault Chimney Seals:
1. As shown on the Contract Drawings, seal the outside of the manhole or vault cone or riser section to the grade rings and manhole and vault frame with a heat shrinkable wrap or a compressible rubber seal with 304 stainless steel compression bands.
 2. Manufacturers:
 - a. Canusa - WrapidSeal Manhole Encapsulation System.
 - b. Cretex Specialty Products - External Manhole Seal.
 - c. ENGINEER-approved equal.

2.04 Configuration

- A. Shaft Construction: Concentric with eccentric cone top section; lipped male/female gasketed joints; flexible rubber joint to receive pipe.
- B. Shape: Cylindrical.
- C. Clear Inside Dimensions: As indicated on Contract Drawings and as required for construction.

- D. Design Depth: As indicated on Contract Drawings and as required for construction.
- E. Clear Lid Opening: As indicated on Contract Drawings and as required for construction.
- F. Pipe Entry: Provide openings as indicated on Contract Drawings and as required for construction.
- G. Steps: As indicated on Contract Drawings and required by applicable safety code.

2.05 Bedding and Cover Materials

- A. Structure and Pipe Bedding: Fill Type A1, A2 or A5 as specified in Section 31 2333 and on the Contract Drawings.
- B. Topsoil Fill Type: S3 or S4 as specified in Section 31 2333 and on the Contract Drawings.
- C. Soil Backfill from Above Pipe to Finish Grade: Soil Type S1 or S2, as specified in Section 31 2333 and on the Contract Drawings.

Part 3 Execution

3.01 Examination

- A. Verify items provided by other sections of Work are properly sized and located.
- B. Verify that built-in items are in proper location, and ready for roughing into Work.
- C. Verify excavation for manholes or vault is correct.

3.02 Preparation

- A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.
- B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.
- C. Inspect precast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.
- D. Prepare manhole or vault for installation of chimney seals per manufacturer's instructions.

3.03 Installation

- A. Excavation and Backfill:
 - 1. Excavate for manholes, vaults and drainage structures in accordance with Section 31 2316 in location and to depth shown. Provide clearance around sidewalls of structure for construction operations.
 - 2. When groundwater is encountered, prevent accumulation of water in excavations. Place manholes, vaults or drainage structures in dry trench.
 - 3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.
 - 4. Placement and compaction of surrounding backfill material shall be accomplished to provide sufficient and equal side pressure on the manhole or vault.

- B. Backfill excavations for manholes, vaults and drainage structures in accordance with Section 31 2316.
- C. Form and place manhole cylinder or vault wall plumb and level, to correct dimensions and elevations.
- D. Connect pipe with flexible rubber joints as shown on the Contract Drawings.
- E. Set cover frames and covers level without tipping, to correct elevations.
- F. Install chimney seals per manufacturer's instructions and Contract Drawings.
- G. Coordinate with other sections of Work to provide correct size, shape, elevation, and location.
- H. Use manufacturer's recommended method, procedure and equipment for handling, installing, and connecting the manholes or vaults.

3.04 Standard Precast Concrete Manhole, Vault and Drainage Structure Installation

- A. Prepare granular bedding as shown on Drawings, to receive integral, monolithically cast base slab as specified.
- B. Lift precast structures at lifting points designated by manufacturer. Grout all lifting holes when structure is in place.
- C. When lowering manholes, vaults and drainage structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.
- D. Set precast structures bearing firmly and fully on granular bedding, compacted in accordance with provisions of Section 02320 or on other support system shown on Contract Drawings.
- E. Assemble multi-section structures by lowering each section into excavation. Lower, set level, and firmly position base section before placing additional sections.
- F. Remove foreign materials from joint surfaces and verify gaskets are installed properly.
- G. Maintain alignment between sections by using guide devices affixed to lower section.
- H. Verify manholes, vaults and drainage structures installed satisfy required alignment and grade.
- I. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Connect pipe to manhole or vault with a flexible rubber joint as specified. Fill annular space with mortar.
- J. Cut pipe to finish flush with interior of structure.
- K. Shape inverts through manhole or vault as shown on Contract Drawings. Provide cast-in-place full height benching. Trowel smooth and slope to drain per Contract Drawings.

3.05 Castings Installation

- A. Set frames using a precast concrete grade ring with butyl rope to seal joint. Use grade ring sizes per Contract Drawings
- B. Unless Contract Drawings indicate otherwise, set frame and cover 6 inch above finished grade for manholes, vaults and other structures with covers located within unpaved areas to allow area to be graded away from cover beginning 1 inch below top surface of frame.
- C. Set frame and cover flush with ground surface for manholes, vaults and other structures located within paved areas.

3.06 Leakage Testing For Manholes and Vaults

- A. After completion of manhole or vault construction, inspect all manholes for leakage and repair all visible leaks.
- B. After repairing all leaks, test manholes and vaults for water-tightness using vacuum testing procedure as follows:
 - 1. Temporarily plug the influent and effluent lines with suitably sized pneumatic or mechanical plugs. Ensure plugs are properly rated for the pressure required for the test. Place plugs a minimum of 6 inches outside the manhole or vault walls. Brace inverts to prevent lines from being dislodged.
 - 2. Install vacuum tester head assembly at the top access point of the manhole or vault and adjust for a proper seal. Following manufacturer’s instructions and safety precautions, inflate sealing element to the recommended maximum inflation pressure. Do not over-inflate.
 - 3. Evacuate manhole or vault with vacuum pump to 10-inches of mercury (Hg). Disconnect the pump and monitor vacuum for the time period specified in the following table:

Vacuum Test Timetable

Depth (feet)	Test Duration (seconds)			
	48-inch Diameter Manhole**	60-inch Diameter Manhole**	72-inch Diameter Manhole**	96-inch Diameter Manhole**
4	30	30	30	30
8	30	30	32	38
12	30	39	48	57
16	40	52	64	76
20	50	65	80	95
24	60	78	96	114
Each 2' more	+5	+6.5	+8	+9.5

** Use equivalent volume for testing vaults

- 4. If the drop in vacuum exceeds 1-inch of mercury (Hg) over the specified time period, locate the leaks and complete repairs necessary to seal the manhole or vault. Repeat the test until acceptable results are obtained.

3.07 Field Quality Control

- A. Test concrete in accordance with Section 03 3000.
- B. Vertical Adjustment of Existing Manhole and Drainage Structures:
 - 1. Where required, adjust top elevation of existing manholes and drainage structures to finished grades shown on Drawings.
 - 2. Reset existing frames, grates, and covers, carefully removed, cleaned of mortar fragments, to required elevation in accordance with requirements specified for installation of castings.
 - 3. Remove concrete without damaging existing vertical reinforcing bars when removal of existing concrete wall is required. Clean vertical bars of concrete and bend into new concrete top slab or splice to required vertical reinforcement, as indicated Drawings.
 - 4. Clean and apply sand-cement-bonding compound on existing concrete surfaces to receive cast-in-place concrete in accordance with Section 03 3000.

End of Section

Section 33 3000 Sanitary Utility Sewerage Piping

Part 1 General

1.01 Scope of Work

- A. This Section includes sanitary sewer Work indicated on the Plans complete with pipe, joints, structures, pipe bedding, installation, television inspection, and testing.

1.02 Related Work Specified Elsewhere

- A. Section 31 2316: Structural Excavation and Backfill:
- B. Section 31 2319: Dewatering
- C. Section 31 2333: Trenching and Backfilling

1.03 Requirements of Regulatory Agencies

- A. Testing shall conform to the applicable requirements of State and local authorities having jurisdiction, and shall include such tests as: deflection, air, exfiltration and infiltration.

1.04 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 - American Society for Testing and Materials
 - 3. MDOT - Michigan Department of Transportation, Standard Specifications for Construction, latest edition
 - 4. NCPI - National Clay Pipe Institute

1.05 Source Quality Control

- A. Laboratory test not less than 1 percent, with a minimum of 3 pieces, each size, material and class of gravity pipe required in the Work.

1.06 Tolerances

- A. The actual grade of the invert of the sewer shall not deviate from plan grade by more than 0.1 feet/100 feet (0.03 m/30 m), and not more than 0.2 ft. (60 mm) in total for a sewer run from manhole to manhole.
- B. Alignment of sewer shall be within 0.2 feet/100 feet (0.06 m/30 m) and within 0.5 feet (150 mm) in total for a sewer run from manhole to manhole.

1.07 Submittals

- A. Submit independent grade checks in accordance with Article 3.06 of this section.
- B. Submit manufacturer's data for pipe bulkheading devices in accordance with Article 3.13 of this Section.

- C. A complete field report of the location of wyes, risers and building leads shall be submitted to ENGINEER at the end of each sewer section of the Project or on the last day of each week, whichever occurs first.
 - 1. Complete field report shall include witnessing by CONTRACTOR of the ends of building leads placed. Witnessing shall consist of recording 3 horizontal distances to the nearest foot (0.3 m) with the lines of measurement at minimum angles of 45 degrees with respect to one another. Witnessing shall also include recording of the depth to nearest 1/2 foot (0.1 m) from the invert at the end of the lead to the finish ground above the end of the lead.
 - 2. No payment will be made for un-witnessed installation or for improperly witnessed installations.
- D. As part of the television inspection, a wye location report shall be submitted to ENGINEER. The report shall contain the precise location of each wye, notes, photographs, and other pertinent information.
- E. Submit 2 copies of the laboratory test reports required per Article 1.05 of this Section to ENGINEER.
- F. Shop Drawings shall be provided of all manhole tees.

1.08 Storage of Materials

- A. Piping material shall not be stacked higher than 4 feet (1.2 m). 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. Joint and sealing materials used in the sanitary sewer system shall be protected from sunlight and stored in cool and clean place until ready for installation.

1.09 Handling of Material

- A. Load and unload piping using suitably approved hoists, skids, etc. Piping shall not be dropped, bumped or allowed to impact against itself. Damaged piping not be used by CONTRACTOR.
- B. Lifting devices shall be suited to the Work and shall protect surfaces from damage.

Part 2 Products

2.01 General

- A. It is the intent of the Articles in Part 2 of this specification section 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 Systems

- A. Pipe shall conform to ASTM C700, extra strength vitrified clay pipe.
- B. Joints for clay pipe shall meet the requirements of ASTM C425. Joints for house leads shall be limited to approved compression type joints with the sealing element bonded to the bearing surfaces.
- C. Only lubricant as supplied by the pipe manufacturer shall be used on the bell and spigot in making up joints and the joints shall be coupled in accordance with the pipe manufacturer's requirements.
- D. Wyes and tees shall be manufactured to the same standards as the pipe. Wye and tee fittings shall be furnished with the spurs securely fastened by the manufacturer to the barrel of the pipe. There shall be no projection on the inner surface of the pipe.

2.03 Precast Concrete Pipe Systems

- A. Non-reinforced Concrete Pipe:
 - 1. Pipe shall conform to ASTM C14 Class III nonreinforced concrete sewer pipe.
 - 2. See Article 2.03.C for requirements for joints.
- B. Reinforced Precast Concrete Pipe System:
 - 1. Pipe shall be ASTM C76. 10-inch (250 mm) diameter pipe shall have steel and concrete as specified for 12-inch (300 mm) diameter pipe, ASTM C76, Class II through Class V, Wall B or Wall C, circular reinforced.
 - 2. Twelve (12) -inch through 30-inch diameter (300 mm through 750 mm) pipes shall be ASTM C76, Class II through V, Wall B or Wall C, circular reinforced.
 - 3. Thirty-six (36) -inch through 108-inch (900 mm through 2700 mm) diameter pipes shall be ASTM C76, Class I through V, Wall B or Wall C, circular or elliptical reinforced.
 - 4. When elliptical reinforcement is used, the following method of indexing the steel and the pipe barrel shall be used:
 - 5. A dummy lift pin form shall be set in the outer pipe wall form projecting into the pipe wall a minimum 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.
 - 6. 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, for providing a means of indexing the pipe in the field to assure proper placement of the pipe.
 - 7. Prior to shipment of the 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.

8. For 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. The design of pipes shall meet the D-load requirements for the class of pipe indicated on the Plans.

C. Joints for Concrete Pipe:

1. Premium joints for concrete pipe shall be ASTM C443 limited as follows: Section 6.1 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 an "O" ring rubber gasket.
2. For concrete pipe sizes 10-inch to 24-inch (250 mm to 600 mm), the modified grooved tongue and bell ends of the pipe shall be made smooth and shall not have over a 3-1/2-degree slope formed to fit the rubber gasket to tolerances as determined by the manufacturer. Pipe tongue shall not be out of round by more than $\pm 1/16$ inch (1 mm).
3. For pipe sizes 27 inches to 108 inches (675 mm to 2700 mm), the modified groove and bell ends of the pipe shall be smooth and shall not have over a 2-degree slope, formed to fit the rubber gasket to tolerances as determined by the manufacturer.
4. For pipe sizes 36 inches (900 mm) and larger, the tongue shall be reinforced with an amount of circular steel equivalent in area to the inner steel cage specified for the pipe barrel and the bell shall be reinforced with an amount of circular steel equivalent in area to the outer steel cage specified for the pipe barrel.
5. For pipe sizes under 36 inches (900 mm) in diameter, including C14-XM5 extra strength, the bell or tongue shall be reinforced. Where the reinforcing steel for the tongue, barrel and bell is not continuous, the steel shall be lapped a minimum of two (2) inches (50 mm).
6. 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 requirements.
7. Joints in concrete pipe 36 inches (900 mm) in diameter 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.

D. Wyes and Tees:

1. Wyes and tees shall be manufactured to the same standards as the pipe. Spurs shall be of the same size and type as the house lead/riser pipe. Wye and tee fittings shall be furnished with the spurs securely fastened by the manufacturer to the barrel of the pipe. There shall be no projection on the inner surface of the pipe.

2.04 ABS Pipe

- A. Acrylonitrile-Butadiene-Styrene (ABS) Truss pipe shall be constructed in accordance with ASTM D2680. Pipe shall be of a double wall construction, braced with a truss-type structure with all three (3) formed in one (1) extrusion. Truss voids shall be filled with lightweight concrete to provide additional compressive strength and bracing.
- B. Solid wall pipe shall conform to ASTM D2751, SDR 23.5.
- C. Joints for Acrylonitrile-Butadiene-Styrene (ABS) composite pipe shall be ASTM D2680, Type S.C., a solvent-cemented joint in which pipe solvent cements into a coupling socket to form the joint closure. Installation of the solvent cement shall be in strict accord with the manufacturer's recommendations.
- D. Wyes and tees shall be manufactured to the same standard as the pipe. Spurs shall be of the same size and type as the house lead/riser pipe. Wye and tee fittings shall be furnished with the spurs securely fastened by the manufacturer to the barrel of the pipe. There shall be no projection on the inner surface of the pipe.

2.05 PVC Truss Pipe

- A. Polyvinyl Chloride (PVC) truss pipe shall be ASTM D2680. The pipe shall be of a double wall construction, braced with a truss-type structure with all three (3) formed in one (1) extrusion. The truss voids are filled with lightweight concrete to provide additional compressive strength and bracing.
- B. Joints for Polyvinyl Chloride (PVC) pipe shall be elastomeric gasketed conforming to ASTM D3212, push on type joint.
- C. Wyes or tees shall be a molded wye or tee fitting per ASTM D2680, with gasketed joints on each end suitable for directly inserting in the mainline pipe. Wye and tee fittings shall be furnished with the spurs securely fastened by the manufacturer to the barrel of the pipe. There shall be no projection on the inner surface of the pipe. Branch connection fitting shall be a gasketed joint suitable for the house lead pipe specified. Saddle connections are not allowed.

2.06 PVC Solid Wall Pipe

- A. PVC Solid Wall Pipe in sizes 6-inch through 15-inch (150 mm through 375 mm) shall be ASTM D3034, SDR 35, and in sizes 18-inch through 27-inch (450 mm through 675 mm) shall be ASTM F679 SDR35, polyvinyl chloride pipe (PVC).
- B. Joints for polyvinyl chloride pipe (PVC) shall be ASTM D3212, push-on type. A joint in which an elastomeric ring gasket is compressed in the annular space between a bell end or socket and a spigot end of pipe.
- C. Wyes or tees shall be a molded wye or tee fitting per ASTM D2680, with gasketed joints on each end suitable for directly inserting in the mainline pipe. Wye and tee fittings shall be furnished with the spurs securely fastened by the manufacturer to the barrel of the pipe. There shall be no projection on the inner surface of the pipe. Branch connection fitting shall be a gasketed joint suitable for the house lead pipe specified. Saddle connections are not allowed.

2.07 Dual Wall Corrugated PVC Pipe – Smooth Interior

- A. Pipe shall be a single extrusion of PVC with a smooth interior and corrugated outer walls. Corrugated outer profile shall be annular and seamless.
- B. Pipe and fittings shall be in accordance with ASTM F949. Joints shall be bell and spigot type with an elastomeric gasket meeting the requirements of ASTM F477 and be suitable for sanitary sewer service and the testing requirements of this section.
- C. 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.
- D. Connections to manholes that utilize a rubber boot (Kor-N-Seal) shall be accomplished by sealing the rubber boot to a rubber gasket installed on the outside of the pipe with the stainless-steel band and clamp assemblies on the outside of the rubber boot. For sizes 21-inch and larger use two stainless band assemblies (with two screw clamp assemblies per band assembly) on the outside of the rubber boot, with the screw clamps staggered around the pipe so that the take-up pressure is equalized.
- E. Connections to manholes with an A-Lok type connection shall use a manhole sleeve designed for connection to an A-Lok assembly with the recommended A-Lok ring number.
- F. Acceptable manufacturers of Dual wall corrugated PVC pipe include Contech A2000, Uponor ETI Ultra-Corr or ENGINEER approved equal.

2.08 Structures

- A. General:
 - 1. Material for sanitary sewer structures shall conform to the requirements as indicated on the plans and as specified below. Precast concrete structures are required except when constructing a structure over an existing sewer may require limited use of concrete block or brick as approved by ENGINEER.
- B. Concrete Brick:
 - 1. Concrete brick shall be ASTM C55, Grade S-II, solid units of nominal 3-inch (75 mm) thickness.
- C. Concrete Block:
 - 1. Block shall conform to ASTM C139, Portland cement conforming to ASTM C150, Type II. Blocks shall be solid curved blocks with the inside and outside surfaces parallel and curved to the required radii. The blocks shall have a groove or other approved type of joint at the ends.
- D. Precast Concrete:
 - 1. Precast concrete manhole, flat top slabs, risers, cone, transition sections and bottom sections shall conform to ASTM C478, and shall be circular with circular reinforcement. For depths greater than 32-feet, manhole shall be designed for

the earth loading at the design depth of bury with a factor of safety of 1.5. Base slab shall be 8 inches (200 mm) thick for depths up to 25 feet (7.5 m) and 12 inches (300 mm) thick for depths greater than 25 feet (7.5 m).

2. Transition sections, reducers and flat top slabs shall be designed for the earth loading at the design depth of bury with a factor of safety of 1.5.
3. Precast doghouse sections shall be used for connections to existing sewer 15 inches (375 mm) and smaller on straight through runs for a depth up to 20 feet (6 m) and on right angle runs, with a maximum of four cutouts for depths up to 12 feet (3.5 m).
 - a. Openings in precast doghouse sections shall be cast in the pipe before curing and no breaking or chipping of sections will be allowed after the manhole section has cured.
 - b. The size of the opening shall be cast as indicated on the Plans.
4. Precast bottom sections shall be cast with the bottom end flat to provide bearing of the full wall thickness. Openings for sewer pipe shall be cast in the manhole and the bottom section by the manufacturer.
5. Six (6) -inch through 24-inch (150 mm through 600 mm) connections to manholes shall use a mechanically compressible flexible joint, as indicated on the Plans.
6. Twenty-seven (27) -inch (675 mm) and larger connections to manholes shall be grouted, as indicated on the Plans.
7. Riser sections of a manhole shall have modified grooved tongue joints with "O" ring gaskets or a tongue and groove joint with a Butyl Rubber based gasket type sealant meeting the requirements of AASHTO M-198 and having a nominal size of 1-inch (25 mm).
8. Eccentric cone sections of a manhole shall have modified grooved tongue joints with "O" ring gaskets and be provided with 4-stud inserts cast in the top. The top shall have a smooth finished surface.
9. Concrete grade rings shall have smooth finished top and bottom surfaces. Grade rings shall be provided with "O" ring gaskets.
10. Precast manhole tees will be allowed on straight through runs with no angle at the manhole and where stubs or openings in manhole are above the tee section.
11. Precast concrete manhole tee units shall conform to ASTM C76, Class IV and shall be circular with circular reinforcement. Precast tees must be a monolithic pour with wire cage inspection prior to concrete placement. Joints for tee shall be the same as the joints on the sanitary sewer.

E. Manhole Steps:

1. 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.

2. Steel reinforced plastic manhole 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 and shall be in accordance with ASTM C478.
3. Manhole steps shall be of the types and sizes indicated on the Plans and shall comply with applicable Michigan Occupational Safety and Health Standards (MIOSHA).

F. Manhole Frames and Covers:

1. Manhole frames and covers shall conform to ASTM A48, Class 30, gray iron and shall be of the types and sizes as indicated on the Plans. Castings shall be neatly made and free from cracks, cold sheets, holes and other defects. Surfaces of casting shall be ground to assure proper fit and to prevent rocking.
2. For manholes, use a bolted waterproof frame with a pressure tight cover. Bolted down frame and cover shall be installed as indicated on the Plans.

2.09 Steel Pipe

- A. Pipe shall conform to ASTM A53, black and hot-dipped galvanized welded and seamless pipe of standard weight.

2.10 Bolt, Studs, Nuts

- A. Bolt, studs, and nuts shall conform to the following ASTM Standards:
 - B. Cadmium Plating: ASTM B766, Grade N.S.
 - C. Zinc Coating: ASTM A153 or B663, Type G.S.

2.11 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 (355 kg/m³); 6A coarse aggregate; 2NS fine aggregate; 6.5% ± 1.5% air content; 3-inch (75 mm) maximum slump; no admixtures without ENGINEER's approval.

2.12 Concrete Reinforcement

- A. In accordance with MDOT Section 905, use ASTM A615, Grade 60 for bars and ASTM A185 for welded wire fabric.

2.13 Flowable Fill

- A. Flowable Fill for Filling abandoned Sanitary Sewers:
 1. Materials:
 - a. Cement: Cement shall conform to ASTM C150 or ASTM C595
 - b. Fly Ash: Fly ash shall have a maximum loss on ignition of 12 percent and meeting the other requirements of ASTM C618 (Class F)
 - c. Water: The water shall meet the requirements of ASTM C94

2. Mixture (Strength 50 to 100 psi) (345 to 690 kPa):
 - a. Fly Ash (Class F): 2,000 lbs/cyd (1185 kg/m³) (minimum)
 - b. Cement: 100 lbs/cyd (60 kg/m³) (minimum)
 - c. Water: Sufficient water to produce the desired flowability (approximately 700 lbs/cyd) (415 kg/m³)
- B. Temperature of the flowable fill mixture as manufactured and delivered shall be at least 50° Fahrenheit (10° Celsius).
- C. Flowable fill can be mixed by pugmill, central concrete mixer, ready mix truck, turbine mixer, or other acceptable equipment or method.
- D. CONTRACTOR shall submit a history of the mix design for seven day and 28 day strengths, together with any other technical information. The design mix shall also be included as part of CONTRACTOR's submittals for project.

Part 3 Execution

3.01 Verification of Excavation and Bedding

- A. Prior to the installation of sanitary 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 piping bedding are adequate to receive the sanitary sewer materials to be installed. Correct defects and deficiencies before proceeding with the Work.

3.02 Existing Sanitary Sewers

- A. CONTRACTOR shall expose the existing sanitary 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 sanitary sewer work with the existing system.
- B. Connecting to an existing manhole requires removing the existing flow channel and constructing a new flow channel as necessary.
- C. When connecting a new sewer to an existing sewer or a new building lead to an existing building lead, where the pipe joints are not compatible, use a "Fernco" rubber adapter. When connecting clay to clay, concrete to concrete or plastic to plastic, use stainless steel shear ring type couplers.

3.03 Verification of Pipe Class and Joints

- A. Prior to the installation of any sanitary sewer piping, ascertain that the class of pipe, joint material and bedding are as specified herein and as indicated on the Plans.

3.04 Preparation of Pipe Ends

- A. Outside surface of the spigot end and the inside surface of the bell end shall be cleaned and free of foreign material, other than sealant recommended by the manufacturer, prior to installation.

3.05 Examination of Material

- A. Pipe, frames, covers, accessories, and appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective or damaged material shall be rejected and removed from the Project by CONTRACTOR.

3.06 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. 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 proper result is obtained. When employing a laser system, CONTRACTOR shall have an alternate and independent means of checking the line and grade. CONTRACTOR shall check line and grade every 100-feet minimum. The finished work shall be straight and shall be sighted through between manholes.
- C. Construction shall begin at the outlet end and proceed upstream 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.
- D. Mechanical means shall be used for pulling home all 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.
- E. After laying of pipe, care shall be taken so as not to disturb its line and grade. Any pipe found off grade or out of line shall be re-laid.
- F. 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 airborne particles shall be employed. Pipe cutting shall be performed using the recommendations of the manufacturer of the type of pipe materials being cut and according to the best trade practices. When cutting of pipe or fittings, care shall be taken to prevent damage to the lining and the exterior surface. Damage to either shall be cause for rejection of complete section.
- G. During the preparation of the pipe bedding and until the trench has been satisfactorily backfilled, the trench shall be kept free of water and sewage. A dewatering system, in accordance with Section 31 2319, Dewatering, shall be provided and maintained by CONTRACTOR. The dewatering system shall remain in operation until the trench is backfilled.
- H. Backfill shall be as indicated on the Plans and as specified in Section 31 2333, Trenching and Backfilling.

3.07 Pipe Laying

- A. Rigid Pipe:
 - 1. Installation of rigid pipe shall conform to ASTM C12. All pipe shall be jointed by means of a resilient gasket. The resilient gasket shall be lubricated and installed to form a watertight joint between the bell and spigot of the pipe. The bell of the pipe in place shall be cleaned and properly lubricated prior to the installation of

the next pipe spigot. The pipe shall be centered in the bell or groove. After the spigot is well entered into the bell and the gasket is fully compressed and brought to final shape, check the gasket for proper position around the full circumference of the joint. Complete installation by pushing the pipe tightly together to form a smooth and continuous invert.

2. Circular concrete pipe with elliptical reinforcement shall be installed with the lift holes on the top of the pipe. The manufacturer's marks designating the top and bottom of the pipe shall not be more than five (5) 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 and grouted.
3. When adapters are required to properly connect the new pipe to an existing pipe of other materials or manufacture, the nominal inside diameter of adapters shall be the same size as the nominal pipe diameter to which it is to be connected.

B. Flexible Pipe:

1. Installation of flexible pipe shall conform to ASTM D2321.
2. Except as otherwise specified herein, installation of ABS and PVC piping shall be made in complete accordance with the published installation guide of the pipe manufacturer.
3. Joints for ABS pipe shall be made by first applying a coat of primer to the inside of the socket and to the outside of the spigot end of the pipe.
 - a. Without delay, apply a coating of cement to the same surfaces in sufficient quantity that when the spigot is fully inserted into the socket, a bead of excess cement will form around the complete circumference of the outside junction of the spigot and socket.
 - b. Remove the excess cement and allow the assembly to cure 24 hours.
4. Joints for PVC pipe shall be made by using a lubricant immediately before joining.
 - a. Apply lubricant on the bell and spigot, coating the entire circumference of the bell and spigot bevel plus 1-inch (25 mm) behind the taper. Insert lubricated spigot into the bell, and using normal force insert spigot until insertion stripe mark is flush with the bell entrance.
5. When jointing ABS or PVC pipe, rotate the pipe when inserting it approximately 1/4 to 1/2 turns.
6. Taps to previously installed ABS and PVC pipes, where in-line fittings are not provided, shall be made with chemically welded saddle fittings unless otherwise indicated on the Plans.
 - a. Holes for saddle connections shall be by mechanical hole cutters, or by keyhole saw or saber saw.

- b. Holes for saddles shall be laid out with a template and shall be deburred and beveled to provide a smooth hole shaped to conform precisely to the fitting.
- c. After the cemented saddle has been fixed to the pipe surface, quickly install band clamps each side of the saddle and tighten.

3.08 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. The 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 all 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 all buried pipe.

3.09 Manhole Structures

- A. General:
 - 1. Construct sanitary sewer manhole and other sanitary structures to the grades, lines and levels indicated on the Plans, or as specified herein.
 - a. Structures shall be precast concrete, complete with concrete bases, reinforcing, frames, covers, and adjustment rings, as shown and as required for a complete installation.
 - b. Sanitary manholes as called for on the Plans shall carry a stub opening as specified herein.
 - c. Wye openings in manholes are prohibited unless indicated on Plans.
 - d. Sanitary sewer structures shall conform to the type of material and dimensions indicated on the Plans.
 - 2. Manholes shall be completed and ready for final inspection either before 600 feet (180 m) of additional sewer construction is completed or within one (1) week after the manhole is constructed, whichever comes first.
- B. Block Structures:
 - 1. Sanitary manholes may only be constructed with block where specifically shown on the plans or where approved by ENGINEER. The first course of concrete block shall be placed on the prepared base in a full bed of mortar. Mortar joints shall be full and closed 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 structure. Strike all joints and properly point to provide true, smooth surfaces.

2. Prior to applying plaster coat, block shall be thoroughly wetted with water and the surface allowed to dry sufficiently to effect proper bonding.
3. Construct as detailed on the Plans.
4. Where precast doghouse sections cannot be used, the manhole shall be brick or block to eight (8) inches (200 mm) above top of highest pipe. Above that point manholes shall be precast concrete as shown on the plans.
5. Cement mortar plaster coat shall be applied to the exterior surfaces of all brick and/or concrete block sections of all manholes. Plaster coat shall be 1/2 inch (10 mm) thick.
6. Provide and install all cast iron covers, frames, adjusting rings, and anchors to the elevation indicated on the Plans, or as specified herein. Castings shall be set on 1-inch (25 mm) diameter rubber "O" ring gasket, resting on adjustment rings. The casting shall be anchored to the precast concrete cone section as indicated on the Plans.
7. Steps are to be installed at the plant by the manufacturer of precast units. Field install steps in other than precast structures of the types and in the locations indicated on the Plans.
8. Pipe, 6-inch through 24-inch (150 mm through 600 mm) diameters, shall be connected to manholes using an approved mechanically compressible flexible joint as indicated on the Plans. The pipe shall be properly supported with compacted pipe bedding material from undisturbed ground so that any settlement will not disturb the connection.
9. Pipe, 27-inch through 42-inch (675 mm through 1050 mm) diameters, or pipe in brick or block manholes, shall be connected to manholes using a grouted joint as indicated on the Plans. The pipe shall be properly supported with 3,500 psi (24 MPa) concrete from undisturbed ground so that any settlement will not disturb the connection.
10. The joint for existing pipe, 6 inches (150mm) in diameter and larger, over which the sanitary manhole will be constructed, shall be a grouted joint as indicated on the Plans.
11. Pipe, 48 inches (1200 mm) in diameter or larger, shall be installed as an integral part of the manhole which shall be constructed of 3,500 psi (24 MPa) concrete placed in one continuous pour to 1-foot (300 mm) above the top of pipe as indicated on the Plans.
12. Concrete flow channels shall be constructed in each manhole, as indicated on the Plans. For manholes with outlet pipe diameter of 24 inches (600 mm) or less, construct concrete flow channel straight through a manhole to conform as closely as possible in shape, and slope to that of the connecting sewers. The channel walls shall be formed or shaped to the full height of the crown of the outlet sewer in such a manner to not obstruct maintenance, inspection or flow in the sewers. The concrete flow channel shall be constructed with a 3/4 inch to 1-1/4 inch (20 mm to 30 mm) gap provided at the pipe ends to maintain joint flexibility.

13. For manholes with outlet pipe diameters from 27 inches to 42 inches (675 mm to 1050 mm) or for manholes constructed over existing sewers to 42 inches (1050 mm) in diameter, the channel shall be constructed by filling around the pipe to the spring line and splitting the pipe at the spring line and removing the top half after the manhole is constructed.

3.10 Sanitary Sewer Stub Opening

- A. Stub openings shall be at least 2 pipe lengths, with a minimum length of 10 feet (3 m) (unless otherwise indicated on the Plan), and the first joint located approximately 18 inches (450 mm) from the outside manhole wall. The end of the stub shall have a manufactured bell, which shall be plugged with a watertight manufacturer plug that is blocked to prevent movement.

3.11 Vent Assembly

- A. Provide materials and construct vent assemblies where indicated on the Plans. Install piping, fittings, joints, vents, etc., as detailed. Vent assemblies shall be installed on undisturbed earth and provided with restraints as indicated on the Plans, and as required for a complete installation. Vent assemblies shall be connected to manholes as indicated on the Plans.

3.12 Drop Connection Assembly

- A. Provide materials and construct drop connection assembly where indicated on the Plans. Install piping, fittings, joints, etc., as detailed.
- B. Tapping of existing manholes for drop connections shall be made by drilling holes through the wall of the manhole at 4-inch (100 mm) centers along the periphery of the opening, to create a plane of weakness joint, before breaking out section. Nonshrink grout shall be used to seal the opening and a 3,500 psi (24 MPa) concrete collar 12 inches (300 mm) thick shall be poured around the pipe. Drop connections to existing or new manholes shall be made as indicated on the Plans.

3.13 Bulkheads

- A. A solid masonry or approved water and airtight bulkhead shall be placed at each point of beginning and at each stub that is constructed or as indicated on the Plans.
- B. At the completion of construction and testing, the bulkheads shall be removed, unless otherwise indicated on the Plans or as directed by ENGINEER.

3.14 Wyes

- A. One 6-inch (150 mm) wye or tee branch shall be provided for each lot or parcel 100 feet (30 m) or less in width that is served by the sewer or every hundred feet (30 m) for lots or parcels in excess of 100 feet (30 m) in width that is served by the sewer, unless otherwise indicated on the Plans or specified.
- B. In all cases, unless otherwise indicated, wyes shall be placed as near as practical to the lower 1/3 point of vacant lots or parcels to be served, and it shall be the responsibility of CONTRACTOR to see that the wyes are so placed. Wyes to developed lots or parcels shall be placed at the location nearest the existing sanitary service lead.

- C. If CONTRACTOR fails to place any wyes as herein outlined he shall return to the site and place additional wyes, in an approved manner, at his expense.
- D. If a concrete pipe with an inset opening is being used, a compression type joint shall be cast into bell end of the opening. Wye openings shall be closed with a 6-inch (150 mm) stopper, as recommended by the manufacturer, to make a watertight closure.

3.15 Risers

- A. Risers shall be installed where the sewer is more than 12 feet (3.5 m) below the established grade or future grade, and carried to between nine (9) and ten (10) feet (2.5 m to 3.0 m) of the established grade or future grade, as indicated on the Plans. Six (6) inch (150 mm) pipe with approved compression type joints, shall be installed in the manner indicated on the Plans.
- B. Riser openings shall be closed with a stopper, as recommended by the manufacturer, to make a watertight closure.

3.16 Building Leads

- A. Building leads shall be 6-inch (150 mm) diameter pipe and shall be laid on a uniform slope of 1/8 inch per foot (10 millimeters per meter) unless greater slope will provide depth considered adequate by NGINEER.
- B. Building leads shall be provided to within 1-foot (300 mm) of property line for all lots or parcels on both sides of the street, unless otherwise indicated on the Plans. If in an easement, the lead shall be provided to within 1-foot (300 mm) of the easement line.
- C. Building lead depth, four-(4) feet (1.2 m) horizontal from property line or permanent easement line, shall be between eight (8) and nine (9) feet (2.5 m to 3.0 m). From this point, a 45-degree bend shall be placed and a short length of pipe such that the end depth will be between five (5) and six (6) feet (1.5 m to 1.8 m).
- D. Building leads under or within five (5) feet (1.5 m) of concrete or asphalt pavements shall be installed by boring or tunneling.
- E. Each building lead shall be closed with a stopper, as recommended by the manufacturer, to make a watertight closure.

3.17 Wye, Riser or Building Lead Marker

- A. Unless otherwise indicated in the Plans or Specifications, prior to the backfilling of a wye, riser or building lead, a 2" x 2" (50 mm x 50 mm) (minimum cross section) wooden marker shall be placed from a point immediately in front of the service connection to 1-foot (0.3 m) below the finish ground surface. Do not rest the marker on any portion of the service connection or stopper.

3.18 Abandoning Sanitary Sewer with Flowable Fill

- A. Install a bulkhead in each end of the sanitary sewer to be abandoned leaving a small opening in the very top of each bulkhead
- B. Install a minimum 2-inch (50 mm) diameter stand pipe in the top of the bulkhead of the sanitary sewer to be abandoned. The stand pipe should be installed such that it can be removed after use and the hole sealed.

- C. Install a minimum 2-inch (50 mm) air release pipe in the bulkhead in the opposite end of the sanitary sewer from the stand pipe. The air release pipe should bend up to a 90 degree angle with the end of the pipe being a minimum of six inches (150 mm) above the top of the sanitary sewer.
- D. Using the stand pipe, pump flowable fill into the sanitary sewer to be abandoned. The flowable fill shall be pumped into the sanitary sewer until free water flows from the air release pipe at the opposite end.
 - 1. Continue filling the sanitary sewer until the material released at the air release pipe is representative of the flowable fill being introduced at the fill end of the sanitary sewer.
- E. Remove the stand pipe and air release pipe and plug the hole in both bulkheads.

3.19 Abandon Existing Manholes

- A. Manholes on the existing sanitary sewer shall be abandoned and the structures shall be removed in accordance with the following:
 - 1. Removal of existing structures shall consist of removing and salvaging the existing frame and cover.
 - 2. Ends of the existing sanitary sewer shall be bulkheaded. Masonry shall be broken down to an elevation at least 30-inches (750 mm) below the proposed subgrade or finished grade.
 - 3. Abandoned structure shall be backfilled with flowable fill to 1-foot (0.3 m) above the pipes and the remainder of the structure with sand-cement mixture at a 10 to 1 ratio to subgrade elevation.

3.20 Field Quality Control

- A. General:
 - 1. After pipe, structures, and leads have been laid, constructed and backfilled, the system shall be final inspected and tested. Inspection and testing shall consist of the following parts: first inspection, television inspection and testing.
 - 2. The first inspection shall be completed and all repairs made in ample time so that the television inspection of the underground portion of the system, can be completed within 4 weeks of the completion of the construction. Television inspection shall be considered completed when the necessary construction repairs have been made and the installation re-televised when required, and the system is acceptable for the testing phase. When re-television is necessary, an additional 2 weeks will be allowed for completion. Testing of the system shall immediately follow the television inspection and shall be completed within a 2-week period.
 - 3. Failure to maintain a schedule in compliance with this specification will automatically cause the stoppage of other work at the particular site in question until such time as the final inspection of the completed underground portion of the system has progressed to within acceptable limits.

B. First Inspection:

1. CONTRACTOR shall have the underground portion of the sewer system ready for the first inspection within 2 weeks after the completion of each 2,000-foot (600 m) section of sewer installed.
2. The first inspection shall consist of a visible and audible check of the sewers and manholes to ascertain that the manhole 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 grades and elevation, the required adjusting rings and frame and cover properly installed, trenches and structures backfilled in a workmanlike manner and that the system has been thoroughly cleaned.
3. The first inspection shall be considered completed when all the repairs have been made and the system is ready for television inspection.

C. Television Inspection:

1. CONTRACTOR shall provide for television inspection of the various sanitary sewer lines installed under this Contract.
2. CONTRACTOR shall arrange for, engage and pay all expenses involved for the services of a competent company to perform this television inspection.
3. The television inspection shall be observed by representatives of OWNER, ENGINEER, and CONTRACTOR. Any television viewing performed in the absence of ENGINEER will not be considered as a part of the final inspection.
4. The inspection shall involve the visual observation by closed-circuit television of all sanitary sewer, eight (8) inches (200 mm) in diameter to 30 inches (750 mm) in diameter inclusive, installed as a part of this Contract.
5. The inspection shall be performed at a maximum rate of speed of 30-feet per minute, which will allow examination of all points of infiltration, cracked or crushed pipe, defective joints, misalignment in line or grade, location of all wye openings and any defects or items of poor workmanship which may appear. Prior to television inspection, CONTRACTOR shall run water down the line to show any dips or high spots in the line. Water shall be run continuously during television inspection if necessary to determine changes in grade in the line.
6. Items which, in the opinion of ENGINEER, require repair shall be precisely located and photographed along with a detailed statement of the condition.
7. CONTRACTOR shall take immediate action to repair all such defects including excessive infiltration at any specific location, even though the infiltration limits as herein specified have not been exceeded for the entire length of sewer being inspected. Following completion of the repair, OWNER or ENGINEER, at their discretion, may require a second television inspection of any repaired areas. CONTRACTOR shall arrange for and pay all costs involved in performing this re-inspection.
8. As a part of the television inspection, the precise location of each wye shall be noted in relation to the downstream manhole.

- a. These locations shall be entered on the Wye Location Sheet as supplied by ENGINEER and verified by comparison with the locations as established at the time of construction.
 - b. Discrepancies in location between the field location record and the television inspection record shall be reconciled and the proper location of the wye determined as a part of the television inspection.
 - c. Two (2) copies of all notes, photographs, wye locations and other pertinent information shall be made as a part of the television inspection.
 - (1) One set of this information shall be turned over to the representative of ENGINEER upon the completion of the inspection of each line.
 - (2) The second copy of the information shall be held by the television inspection company until completion of the project, at which time it shall be neatly assembled and turned over to ENGINEER as a complete, comprehensive report on the television inspection of the project.
9. Television inspection shall be recorded and shall be submitted in the format(s) as specified by ENGINEER.
- a. DVD Disk:
 - (1) Audio/video route survey submission shall be on DVD media meeting the following specifications:
 - (a) Media: DVD-R or DVD+R, 4.7GB, single layer
 - (b) Format: DVD - Video
 - (c) Video Encoding: Highest available bit rate (6-9 Megabit), 60 fields per second interlaced video
 - (d) Audio Encoding: Uncompressed stereo wave or stereo Dolby Digital (256 kilobit or better)
 - (e) Aspect Ratio: 4x3 (720x480 pixels)
 - (f) No Macrovision or other copy protection encoding. No region code or region code 1.
10. Television inspection shall be considered completed when the necessary construction repairs have been made and the installation retelevised when required, and the system is acceptable for the testing phase.
- D. Testing:
1. CONTRACTOR shall provide the necessary supervision, labor, tools, equipment and the materials necessary for the tests which shall be conducted in the presence of ENGINEER. ENGINEER shall be notified two (2) working days in advance of all testing. The following tests shall be performed and approved prior to placing any system in service:

- a. Leakage tests shall be conducted on all new sewer lines and existing lines which have not been previously approved.
- b. Sewers shall be subjected to air, exfiltration or infiltration tests, or a combination of same, prior to acceptance.
 - (1) Sewers over 24-inch (600 mm) diameter shall be subjected to infiltration tests.
 - (2) Sewers of 24-inch (600 mm) diameter or smaller, where the groundwater level above the top of the sewer is over 7 feet (2m), shall be subjected to infiltration tests.
 - (3) Sewers of 24-inch (600 mm) diameter or less, where the groundwater level above the top of the sewer is 7 feet (2 m) or less, shall be subjected to air tests or exfiltration tests.

2. Exfiltration/Infiltration Test:

- a. Exfiltration and Infiltration testing will be performed in accordance with ASTM C1091 except as specified herein. If an exfiltration test is performed, the maximum exfiltration rate shall be the same as the permitted from infiltration. For the purposes of exfiltration testing, the internal water level shall be equal to the external water level plus 7feet (2 m) as measured from the top of pipe, and the elevation must be at least as high as the highest house service.
- b. Maximum allowable infiltration shall not exceed 100 gallons per inch of diameter per mile of pipe between manholes per 24 hours (18.5 L/mm diameter/km length/24 hours) for any section of the system and shall include the infiltration from all manholes and other appurtenances.

3. Air Test:

- a. The procedure for air testing of sewers shall be in accordance with ASTM C828 for Vitriified Clay Pipe, ASTM C924 for Concrete Pipe, and ASTM F1417 for Plastic Pipe except as follows:
- b. House leads shall be properly plugged and blocked to withstand the air pressure. The sewer line shall be tested in increments between manholes. The line shall be cleaned and plugged at each manhole. Such plugs shall be designed to hold against the test pressure and shall provide an airtight seal. One (1) of the plugs shall have an orifice through which air can be introduced into the sewer. An air supply line shall be connected to the orifice. The air supply line shall be fitted with suitable control valves and a pressure gauge for continually measuring the air pressure in the sewer. The pressure gauge shall have a minimum diameter of 3-1/2 inches (90 mm) and range of 0 - 10 psig (0 to 70 kPa). The gauge shall have minimum divisions of 0.10 psig (0.5 kPa) and an accuracy of \pm 0.04 psig (0.2 kPa).

- c. The sewer shall be pressurized to an initial test pressure of 4.0 psig (27.5 kPa) greater than the greatest back pressure caused by groundwater over the top of the sewer pipe. At least 2 minutes shall be allowed for the air pressure to stabilize. If necessary, air shall be added to the sewer to maintain a pressure within 1.0 psig (7 kPa) of the initial test pressure.
 - d. After the stabilization period, the air supply control valve shall be closed so that no more air will enter the sewer. The sewer air pressure shall be noted and timing for the test begun. The test shall not begin if the air pressure is not within 1.0 psig (7 kPa) of the initial test pressure.
 - e. The time required for the air pressure to decrease 1.0 psig (7 kPa) during the Test shall not be less than the time calculated from Table 1 and the Appendices of the applicable ASTM standard as noted above.
 - f. Manholes on sewers to be subjected to air tests shall be equipped with a 1/2 inch (10 mm) diameter galvanized capped pipe nipple extending through the manhole wall, three (3) inches (75 mm) into the manhole and at an elevation equal to the top of the sewer pipe. Prior to the air test, the groundwater elevation shall be determined by blowing air through the pipe nipple to clear it and then connecting a clear plastic tube to the pipe nipple. The tube shall be suspended vertically in the manhole and the groundwater elevation determined by observing the water level in the tube. The air test pressure shall be adjusted to compensate for the maximum groundwater level above the top of the sewer pipe to be tested. After all tests are performed and the sewer is ready for final acceptance, the pipe nipple shall be removed and the hole in the manhole wall shall be plugged with hydraulic cement.
4. If a sewer fails to pass any of the previously described tests, CONTRACTOR shall determine the location of the leaks, repair them and retest the sewer. The tests shall be repeated until satisfactory results are obtained.

3.21 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.
 1. Maximum allowable deflection (reduction in vertical inside diameter) shall 5 percent.
 2. Locations with excessive deflection shall be excavated and repaired by re-bedding and/or replacement of the pipe.
 3. 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 9 legs.

End of Section

Section 33 3410 High Density Polyethylene (HDPE) Pipe and Fittings

Part 1 General

1.01 Scope of Work

- A. CONTRACTOR shall furnish labor, materials, equipment, and incidentals required to install High Density Polyethylene (HDPE) pressure pipe, fittings, and appurtenances as shown on the Drawings and specified in the Contract Documents.

1.02 Related Work Specified Elsewhere

- A. Section 31 2333: Trenching and Backfilling
- B. Section 33 3410.15: Leakage Testing for High Density Polyethylene Pipe

1.03 Reference Standards

- A. Work shall conform to applicable provisions of the Contract Documents and to the latest edition of following standards, except as modified in this Section:
 - 1. AWWA C906: Polyethylene (PE) Pressure Pipe and Fittings, 4 inch through 63 inch, for Water Distribution
 - 2. ASTM D1248: Standard Specifications for Polyethylene Plastics Molding and Extrusion Materials
 - 3. ASTM D2837: Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
 - 4. ASTM D3035: Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter
 - 5. ASTM D3350: Standard Specification for Polyethylene Plastic Pipe and Fittings Materials
 - 6. ASTM E3261: Standard Specification for Butt Heat Fusion Polyethylene Plastic Fittings for Polyethylene (PE) Plastic Pipe and Fittings Materials
 - 7. ASTM F2164: Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure

1.04 Submittals

- A. Detailed Plans and Shop Drawings:
 - 1. Submittals shall be made in accordance with Section 01 3300, Submittals, and shall include:
 - a. A list of materials to be furnished, the names of the suppliers, and the appropriate shop drawings for HDPE pipe and fittings;
 - b. Pipe manufacturer's certification of compliance with the applicable sections of the Specifications; and

- c. Shop drawings showing installation method and the proposed method and specialized equipment to be used.
- B. Permits and Inspection Records:
 - 1. Prior to beginning any horizontal directional drilling operations, submit copies of all permits and inspection records obtained from state and local authorities having jurisdiction as described under Article 1.03 of this Section.
- C. Record Drawings:
 - 1. Submit as-built records, in duplicate, within five (5) days of Substantial Completion. As-built records shall include plan, profile, and information recorded during the progress of the Work, including subsurface anomalies.

1.05 Quality Assurance

- A. Qualification of Manufacturer:
 - 1. HDPE pipe, fittings, and appurtenances shall be furnished by a single manufacturer who is fully experienced, reputable and qualified in the manufacture of the items to be furnished.
 - 2. Manufacturer shall have manufacturing and quality control facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications.
- B. Requirements of Regulatory Agencies:
 - 1. Federal, State, and Local Regulations: Conform to the requirements of federal, state, and local regulatory agencies having jurisdiction.
- C. Permits and Inspections:
 - 1. Where applicable, obtain and pay for permits and inspections for horizontal directional drilling operations as required by PA 451, State of Michigan, 1994, and all government and private agencies having jurisdiction.
 - 2. No additional compensation shall be allowed because of CONTRACTOR's failure to obtain and pay for such permits and inspections.
 - 3. CONTRACTOR shall be aware of, and conform to, OWNER-obtained permits.

1.06 Warranty and Acceptance

- A. Warrant Work to be free from defects in workmanship and materials for a period of one year from the date of completion of construction. If Work meets these specifications, a letter of acceptance, subject to the one year warranty period, shall be given at the time of completion.
- B. A final acceptance letter shall be given upon final inspection at the end of the one year warranty period, provided the work still complies with these specifications.

In the event deficiencies are discovered during the warranty period, they shall be corrected by CONTRACTOR without additional charge to OWNER before final acceptance.

- C. During the warranty period, ENGINEER shall determine if warranty repairs or replacement work shall be performed by CONTRACTOR.

Part 2 Products

2.01 High Density Polyethylene (HDPE) Pipe and Fittings

A. Fabrication:

1. Pipe and fittings shall be PE3408 high density polyethylene meeting cell classification of 345434E/C per ASTM D3350.
2. Pipe and fittings shall be manufactured in accordance with ASTM F714, Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter; or ASTM D3035, Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter. Piping shall bear markings indicating either SDR-PR or DR-PR.
3. Pipes and fittings shall be suitable for use as pressure conduits, listed as NSF 14 and NSF 61, and per AWWA C906 Pressure Class100 have a nominal burst value of three and one-half times the Working Pressure Rating of the pipe.

B. Pipe Identification:

1. The following shall be continuously indent printed on the pipe, or spaced at intervals not exceeding 5 feet:
 - a. Name and/or trademark of the pipe manufacturer
 - b. Nominal pipe size
 - c. Dimension ratio
 - d. The letters "PE" followed by the polyethylene grade in accordance with ASTM D1248 followed by the hydrostatic design basis in pounds per square inch (psi).
 - e. Service identification by co-extruding multiple equally spaced color stripes into the pipe outside surface or by solid colored pipe shell. Striping material shall be the same material as the pipe material except for color. The following colors shall be used to identify piping service:
 - (1) Blue.....Potable Water
 - (2) Green.....Wastewater or Force Main
 - (3) Black.....Raw Water

C. Fittings:

1. General:

- a. Molded fittings and fabricated fittings shall be fully pressure rated to match the pipe SDR pressure rating to which they are made. Fittings shall be molded or fabricated by the manufacturer. CONTRACTOR-fabricated fittings shall not be permitted unless approved by ENGINEER.
 - b. Manufacturer of the HDPE pipe shall supply HDPE fittings and accessories as well as any adapters and/or specials required to perform the work as shown on the Drawings and specified herein.
 - c. Fittings shall be installed using butt-fused fittings, thermo-fused fittings/couplings, or flanged adapters and must be approved by ENGINEER.
 - d. Transition from HDPE pipe to ductile iron or PVC shall be made per the approval of ENGINEER and per HDPE pipe manufacturer's recommendations and specifications.
 - e. A molded flange connector adapter within a carbon steel back-up ring assembly shall be used for pipe type transitions. Ductile iron back-up rings shall mate with cast iron flanges per ANSI B16.1. A 316 stainless steel back-up ring shall mate with a 316 stainless steel flange per ANSI B16.1.
 - (1) Transition from HDPE to ductile iron fittings and valves shall be approved by ENGINEER before installation.
 - (2) No solid sleeves shall be allowed between such material transitions.
2. Polyethylene Fittings and Custom Fabrications:
- a. Polyethylene fittings and custom fabrications shall be molded or fabricated by the pipe manufacturer.
 - b. Butt fusion outlets shall be made to the same outside diameter, wall thickness, and tolerances as the mating pipe.
 - c. Fittings and custom fabrications shall be fully rated for the same internal pressure as the mating pipe. Pressure de-rated fabricated fittings are prohibited.
3. Molded Fittings:
- a. Molded fittings shall be manufactured in accordance with ASTM D3261 and shall be so marked.
 - b. Each production lot of molded fittings shall be subjected to the tests required under ASTM D3261.
4. Fabricated Fittings:
- a. Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings.
 - b. Fabricated fittings shall be rated for internal pressure service equivalent to the full service pressure rating of the mating pipe.

- c. Directional fittings 16 inches IPS and larger such as elbows, tees, crosses, etc., shall have a plain end inlet for butt fusion and flanged directional outlets.
 - d. Part drawings shall be submitted for the approval of the ENGINEER.
5. Polyethylene Flange Adapters:
- a. Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion joining machine without the use of a stub-end holder.
 - b. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves to provide gasketless sealing, or to restrain the gasket against blow-out.
6. Back-up Rings and Flange Bolts:
- a. Flange adapters shall be fitted with lap joint flanges pressure rated equal to or greater than the mating pipe.
 - b. Lap joint flange bore shall be chamfered or radiused to provide clearance to the flange adapter radius.
 - c. Flange bolts and nuts shall be Grade 2 or higher.

2.02 Tracer Wire

- A. Two strands of copper clad steel wire with 30 mil high density polyethylene insulation shall be installed.
- B. Concentric copper cladding shall be metallurgically bonded to a steel core through a continuous solid cladding process.
- C. Copper cladding to measure 3% minimum of the overall wire diameter.
- D. Wire to be 12 AWG, 0.0808 inches in diameter, 0.00242 inches nominal copper thickness, 9.5270 ohms nominal resistance per 1,000 feet, 675 pounds breaking strength.

Part 3 Execution

3.01 Preparation

- A. Layout of the Work:
 - 1. Stake, mark, and layout the Work using suitable stakes and markers to facilitate verification of grades, lines, levels, and locations of the Work to be performed in a manner acceptable to ENGINEER.
 - 2. From reference points established by ENGINEER on the surface of the ground, carry line and grade down to the bottom of any shafts or boring pits. Perform the Work to the line and grades established; protect such reference points throughout the progress of the Work.

- B. Examination of Materials:
1. Prior to performing any installation Work, examine pipe for damage including but not limited to cracks, breaks, bends, dents, broken ends, or other damage which might affect the structural integrity, performance requirements, or jointing as shown on the Plans, specified herein, or as directed by ENGINEER.
 2. Defective pipe removed from the site and replaced with pipe at the expense of CONTRACTOR.

3.02 Installation of HDPE Pipe And Fittings

- A. HDPE pipe shall be installed by direct bury, directional bore, or a method approved by OWNER/ENGINEER prior to construction.
- B. Installation shall be in accordance with Manufacturer's recommendations and this specification. Necessary precautions shall be taken to ensure a safe working environment in accordance with the applicable codes and standards.

3.03 Heat Fusion Joining

- A. Joints between plain end pipes and fittings shall be made by butt fusion, and joints between the main and saddle branch fittings shall be made using saddle fusion using only procedures that are recommended by the pipe and fitting Manufacturer. External and internal beads shall not be removed.

3.04 Mechanical Joining

- A. General:
1. Polyethylene pipe and fittings may be joined together or to other materials by means of flanged connections (flange adapters and back-up rings) or mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material.
 2. Mechanical couplings shall be fully pressure rated and fully thrust restrained such that when installed in accordance with manufacturer's recommendations, a longitudinal load applied to the mechanical coupling will cause the pipe to yield before the mechanical coupling disjoins.
 3. External joint restraints shall not be used in lieu of fully restrained mechanical couplings.
- B. Installation:
1. Mechanical joints and flange connections shall be installed in accordance with the Manufacturer's recommended procedure.
 2. Flange faces shall be centered and aligned to each other before assembling and tightening bolts. In no case shall the flange bolts be used to draw the flanges into alignment.
 3. Bolt threads shall be lubricated, and flat washers shall be fitted under the flange nuts. Bolts shall be evenly tightened according to the tightening pattern and torque step recommendations of the manufacturer.

4. At least one hour after initial assembly, flange connections shall be retightened following the tightening pattern and torque step recommendations of the Manufacturer. Final tightening torque shall be 100 ft-lbs or less, as recommended by the Manufacturer.

3.05 Branch Connections

- A. Branch connections to the main shall be made with saddle fittings or tees. Polyethylene saddle fittings shall be saddle fused to the main pipe.

3.06 Foundation and Bedding

- A. Pipe shall be laid on grade and on a stable foundation in accordance with Section 33 1100, Water Utility Distribution Piping, and/or Section 33 3400, Sanitary Utility Force Mains.

3.07 Testing

- A. Butt Fusion Testing:
 1. On every day butt fusions are to be made, the first fusion of the day shall be a trial fusion.
 - a. The trial fusion shall be allowed to cool completely prior to cutting out test straps.
 - b. Tests strap shall be 12 inches (min) or 30 times the wall thickness in length with the fusion in the center, and 1 inch (min) or 1.5 times the wall thickness in width.
 - c. Test straps shall be bent until the ends of the strap touch. If the fusion fails at the joint, a new trial fusion shall be made, cooled completely, and tested.
 - d. Butt fusion of pipe to be installed shall not commence until a trial fusion has passed the bent strap test.
 2. Perform butt fusion joints in the presence of ENGINEER or his representative. Record the temperature and corresponding time for each fusion joint.
- B. Hydrostatic Pressure Testing: HDPE pipes shall be pressure tested in accordance with Section 33 3410.15, Leakage Testing for High Density Polyethylene Pipe.

3.08 Backfilling

- A. After the pipe has been installed and approved by ENGINEER, CONTRACTOR shall backfill the trenches as specified in Section 31 2333, Trenching and Backfilling.

End of Section

Section 33 3410.15 Leakage Testing for HDPE Pipe

Part 1 General

1.01 Scope of Work

- A. Work specified in this section consists of testing for signs of leakage in pipelines and structure to ensure they are watertight. CONTRACTOR shall furnish labor, equipment, air, water and other materials, including meters, gauges, smoke producers, blowers, pumps, compressors, fuel, bulkheads and accessory equipment for the complete and proper testing of specified utilities.
 - 1. Test gravity sewers and drain lines by low pressure air testing.
 - 2. Test all other pipelines with water under the specified pressures.

1.02 Related Work Specified Elsewhere

- A. Section 33 1100: Water Utility Distribution Piping
- B. Section 33 3000: Sanitary Sewerage Utilities
- C. Section 33 3400: Sanitary Utility Sewerage Force Mains

1.03 Submittals

- A. The following shall be submitted in accordance with Section 01 3300:
 - 1. Pre-Testing Report: Prior to placing the sewer system in service, CONTRACTOR shall submit to ENGINEER a detailed bound report summarizing the leakage test data, describing the test procedure and showing the calculations on which the leakage test data is based.
 - 2. Post Resting Report: Following leakage testing, CONTRACTOR shall submit to ENGINEER a detailed bound report summarizing the leakage test data, including:
 - a. Length and diameter of section to tested (manhole to manhole);
 - b. Location of all service laterals and their status (active or inactive);
 - c. Type of plugs used and where;
 - d. Depth of sewer, and ground water pressure over pipe;
 - e. Stabilization time period and air pressure;
 - f. Actual air test pressures used if ground water is present;
 - g. The allowed time by specifications versus the actual test time;
 - h. The air pressure at beginning and end of test;
 - i. The name of the person performing the testing;
 - j. Date(s) and time(s) of testing, including any retesting; and,
 - k. Description of any repairs made following testing.

1.04 Reference Standards

- A. ASTM F1417-92: Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air

- B. ASTM F2164-02: Field Leak Testing of Polyethylene Pressure Piping System Using Hydrostatic Pressure

Part 2 Products (Not Used)

Part 3 Execution

3.01 General

- A. New HDPE pipelines installed shall be tested for leakage. Tests to be performed shall be witnessed by ENGINEER.

3.02 Flushing

- A. Mains shall be flushed to remove sand and other foreign matter.
- B. The velocity of the flushing water shall be at least 4 feet per second (fps).
- C. Flushing shall be terminated at the direction of ENGINEER.
- D. Dispose of the flushing water without causing a nuisance or property damage.
- E. Temporary flush out connections shall be installed on all dead end water mains at the locations shown on the Drawings.

3.03 Restrain Against Movement

- A. Before applying pressure, all piping and all components in the test section must be restrained. This means that if piping or parts move or separate during the test, it will not result in damage or injury. Never conduct leak tests on unrestrained piping.
 - 1. Heat fusion joints must be properly cooled before testing.
 - 2. Mechanical connections must be completely installed and tightened per manufacturer's instructions.
 - 3. If backfill provides restraint, it must be properly placed and compacted. Joints and connections may be exposed for inspection.
 - 4. End closures must be suitable for pressure service and pressure-rated for the test pressure.
 - 5. Ensure that connections to test equipment are secure. Disconnect or isolate all low pressure filling lines and other parts that are not to be subjected to test pressure. Restrain, isolate or remove expansion joints before leak testing.

3.04 Test Section

- A. Testing may be conducted on the full system or in sections. Test section length is determined by the capacity of the testing equipment. Lower capacity pressurizing or filling equipment may not be capable of completing the test within permissible time limits. If so, use higher capacity test equipment or select a shorter test section.
- B. Before applying test pressure, allow time for the test fluid and the test section to equalize to a common temperature.

3.05 Test Pressure

- A. For pressure piping systems that include polyethylene pipe or fittings:
 - 1. The maximum permissible test pressure is measured at the lowest elevation in the test section.
 - 2. The maximum permissible test pressure is the lower of (a) 150% of the system design operating pressure provided that all components in the test section are rated for the test pressure, or (b) the pressure rating of the lowest pressure rated component in the test section.
- B. For leak testing purposes, the maximum allowable test pressure in polyethylene pipe is 150% of the pipe’s design pressure rating for the application and the application service temperature.
- C. Do not subject lower pressure rated, non-polyethylene parts or devices to pressures above their pressure rating. Lower pressure rated parts may be removed or isolated from the test section to avoid damage or failure. Vent isolated parts or equipment to atmosphere.
- D. Thermoplastic pipes have reduced strength at elevated temperature. Test pressure must be reduced when the test section is at elevated temperature either from service conditions or from environmental conditions such as being warmed by the sun. Multiply the test pressure by the multiplier shown in the table below to determine the allowable elevated temperature test pressure.

Test Section Temperature °F (°C)	< 80 (< 27) ¹	< 90 (< 32)	<100 (< 38)	<110 (< 43)	< 120 (< 49)	< 130 (< 54)	< 140 (< 60) ²
Multiplier	1.00	0.90	0.80	0.75	0.65	0.60	0.50

¹ Use the 80°F (27°C) multiplier for 80°F (27°C) and lower temperatures.
² The maximum service temperature for polyethylene pressure piping is 140°F (60°C).

3.06 Test Duration

- A. When testing at pressures above system design pressure up to 150% of the system design pressure, the maximum test duration is eight (8) hours including time to pressurize, time for initial expansion, time at test pressure, and time to depressurize the test section.
 - 1. If the test is not completed due to leakage, equipment failure, or for any other reason, depressurize the test section completely, and allow it to relax for at least eight (8) hours before pressurizing the test section again.
- B. Testing at excessive pressure or for excessive time may damage the piping system.
- C. When testing at system design pressure or less, test duration including time to pressurize, time for initial expansion, time at test pressure and time to depressurize should be limited to a practical time period given that the test section is not to be left unsupervised at any time during leak testing.

3.07 Hydrostatic Leak Testing

- A. This hydrostatic leak test procedure consists of filling, an initial expansion phase, a test phase, and depressurizing. There are two alternatives for the test phase.
1. Filling:
 - a. Fill the restrained test section completely with test liquid; ensure that there is no air trapped in the test section. Failure with entrapped air can result in explosive release and result in death or serious bodily injury. Use equipment vents at high points to remove air.
 2. Initial Expansion Phase:
 - a. Gradually pressurize the test section to test pressure, and maintain test pressure for three (3) hours. During the initial expansion phase, polyethylene pipe will expand slightly. Additional test liquid will be required to maintain pressure. It is not necessary to monitor the amount of water added during the initial expansion phase.
 3. Test Phase - Alternate 1:
 - a. Immediately following the initial expansion phase, reduce test pressure by 10 psi, and stop adding test liquid.
 - b. If test pressure remains steady (within 5% of the target value) for one (1) hour, no leakage is indicated.
 4. Test Phase - Alternate 2:
 - a. This alternative is applicable when the test pressure is 150% of the system design pressure. Immediately following the initial expansion phase, monitor the amount of make-up water required to maintain test pressure for one (1), or two (2), or three (3) hours.
 - b. If the amount of make-up water needed to maintain test pressure does not exceed the amount in the table below, no leakage is indicated.

Nominal Pipe Size (inches)	Make-up Water Allowance (gallons/100 ft of pipe)		
	1-Hour Test	2-Hour Test	3-Hour Test
6	2.0	2.8	3.5
8	4.5	5.0	5.5
10	6.3	7.0	8.0
12	9.0	12.0	15.0
14	22.0	0.10	0.10
16	0.11	0.15	0.25
18	0.38	0.41	0.6
20	0.7	1.0	1.3
22	2.3	2.5	2.8
24	3.3	4.3	5.5

Nominal Pipe Size (inches)	Make-up Water Allowance (gallons/100 ft of pipe)		
	1-Hour Test	2-Hour Test	3-Hour Test
30	16.2	18.0	23.1
32	27.0	31.4	0.16
36	0.40	0.58	0.62
42	0.9	1.0	1.5
48	2.1	3.4	3.7
54	4.2	5.0	6.5

3.08 Low Pressure Air Testing of Gravity Flow Systems

- A. For gravity flow and low or intermittent pressure applications such as sewer and odor control, leak testing in accordance with ASTM F1417 is recommended.

3.09 Other Leak Tests

- A. Low Pressure Air Testing of Gravity Flow Systems:
 - 1. For gravity flow and low or intermittent pressure applications such as sewer and odor control, leak testing in accordance with ASTM F1417 is recommended.
- B. Initial Service Leak Testing:
 - 1. An initial service leak test may be acceptable when other types of tests are not practical, or when leak tightness can be demonstrated by normal service, or when an opportunity is afforded by performing initial service tests of other equipment. An initial service leak test may apply to systems where isolation or temporary closures are impractical, or where checking out pumps and other equipment allows the system to be examined for leakage prior to full-scale operations.
 - 2. The piping system should be gradually brought up to normal operating pressure, and held at normal operating pressure for at least ten (10) minutes. During this time, joints and connections may be examined for leakage.
- C. At the conclusion of the test, depressurize the test section by the controlled release of fluid from the test section. Controlled release avoids the potential for pressure surge.

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, Standard Specifications for Construction, latest edition
 - 5. NCPI - National Clay Pipe Institute

1.04 Source Quality Control

- A. Laboratory test not less than 1 percent, with a minimum of 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. Provide manufacturer's data and installation instructions for precast manhole and vault sections, joint connections, water stops, gaskets, corrosion protection system, flexible pipe joints, chimney seals, manhole and vault castings, and other pertinent information for precast and cast-in-place manholes and vaults.

- D. Submit shop drawings and design information for all precast concrete box sections, including but not limited to joint connections, water stops, gaskets, corrosion protection system, and other pertinent information.
- E. Manufacturers Certification: Certify that all products furnished meet or exceed the specified requirements, including worst case depth loadings for this project.
- F. Calculations: Submit calculations for review sealed and signed by a registered Professional Structural Engineer in the State of Michigan. Include structural, depth of bury, buoyancy, and all other information necessary to determine adequacy of the item.

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.
- B. 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 an 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

- 2.13** 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. 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, flat top slabs, risers, cone, bases, grade rings, transition sections and bottom sections shall conform to ASTM C478, and shall be circular with circular reinforcement. For depths greater than 32-feet, the manhole shall be designed for the earth loading at the design depth of bury with a factor of safety of 1.5. Base slab shall be eight (8) inches (200 mm) thick for depths up to 25 feet (7.5 m) and 12 inches (300 mm) thick for depths greater than 25 feet (7.5 m).
 - b. Transition sections, reducers and flat top slabs shall be designed for the earth loading at the design depth of bury with a factor of safety of 1.5.

- 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.
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/m³); 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.
 - 1. Pipe cutting methods that produce a smooth, square-cut end without damage to the pipe and that minimize air-borne particles, shall be employed.
 - 2. 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.
 - 3. When cutting pipe, care shall be taken to prevent damage to the interior and exterior surfaces.
 - 4. 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.
 - 1. 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.
 - 1. Pipe shall be laid to the line and grade called for on the Plans.
 - 2. Each pipe as laid, shall be checked by CONTRACTOR with line and grade pole or laser system to insure that this result is obtained.
 - 3. When employing a laser system, CONTRACTOR shall have an independent and alternate means of checking the line and grade.
 - 4. Finished work shall be straight and shall be sighted through between manholes.
- D. 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.
- E. Lubricants, primers or adhesives as recommended by the pipe or joint manufacturer shall be used immediately prior to jointing.
- F. 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.
- G. 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.
- H. 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.
- I. Type "HE" elliptical pipe shall be installed with the longer axis placed horizontally within a tolerance of plus or minus five degrees ($\pm 5^\circ$).
- J. Type "VE" elliptical pipe shall be installed with the longer axis placed vertically within a tolerance of plus or minus five degrees ($\pm 5^\circ$).

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.
- B. Bulkhead the opening in storm sewers or structures where the existing storm sewer has been removed.
- C. 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