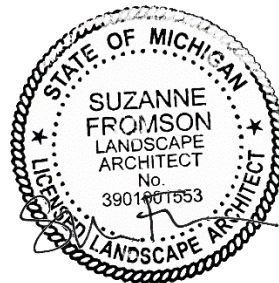


Contract Drawings and Specifications for:

Tierney Park Improvements Project Village of Lexington, Michigan

3/26/2025

Issued for Bid



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Village of Lexington Front-End Specifications

Technical Specifications

Contract Drawings

Attachments for Reference:

A – Geotechnical Report

Owner:



Village of Lexington
7227 Huron Avenue, Suite 100
Lexington, MI 48450
(810) 359-8631

Engineer:



EDGEWATER RESOURCES, LLC
518 Broad Street, Suite 200
St. Joseph, MI 49085
(269) 408-6387

VILLAGE OF LEXINGTON
TIERNEY PARK RENOVATION

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INVITATION TO BID / REQUEST FOR PROPOSAL

ITEM: Village of Lexington Harbor Redevelopment Project (the "Project")

BID SUBMISSION DEADLINE: April 23, 2025 at 1:00PM

BID OPENING: April 23, 2025 at 2PM
Village of Lexington Village Hall
7227 Huron Ave
Lexington, Michigan 48450

- 1. SCOPE OF WORK** – The project includes complete renovation of the Village of Lexington's Tierney Public Park at the Lexington Harbor waterfront. The park of approximately 6.2 acres is located on Lake Huron between the main downtown connector of Huron Avenue to the south, and Simons Street to the north, and is directly adjacent to the Lexington State Harbor marina and Boaters Services facility. The park improvements include improved roadways and drop-off zones, improved parking for both park users and boaters, new restroom facility, new pavilion for picnic and entertainment use, a network of pathways including waterfront boardwalk, site utilities, lighting, native planting, and site furniture. Also included is removal of the existing marine fuel tanks, addition of new marine fuel system, and connection to existing marina fuel system. The marina is scheduled for renovation under separate contract, with anticipated schedule to follow Tierney Park improvements.
- 2. OWNER** – The Owner of the project is the Village of Lexington, 7227 Huron Ave., Lexington, MI 48450
- 3. DESIGN PROFESSIONAL** – The OWNER has contracted Edgewater Resources, LLC to be the Landscape Architect/Engineer/Professional for the project.
- 4. SUBMISSION AND RECEIPT OF BIDS**
To be considered bids must be received prior to the specified deadline as designated on the bid form. The Village of Lexington (the "Village") reserves, in its sole discretion, the right to postpone the bid opening for its own convenience. Bidders shall use the bid documents furnished and no other may be accepted. Bids are considered received when in the possession of the Village of Lexington.

The bid shall be a total price to complete the Tierney Park Improvements Project consistent with the specifications detailed in the bid documents. The bid shall include a schedule of values for each area of work as outlined in 00 04 00 Bid Form, attached.

Plans, detailed specifications, and proposal forms are available for download at www.BidNetDirect.com. Reference # 0000380827. **Copies of bid documents obtained from any other source are not considered authorized copies.** Only those bidders who

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obtain bid documents through BidNet Direct are guaranteed access to receive addendum information, if such information is issued.

Bids will be received either digitally through BidNet Direct or as hard copies submitted by sealed envelope. The envelope shall contain one (1) electronic (thumb drive or similar) and three (3) complete hard copies of the bid and required bid information. Bids shall be sealed when submitted. Separate bids shall be submitted on each bid number and bids shall be typewritten in ink and legibly prepared. Bids having erasures or corrections thereon may be rejected unless explained or initialed by the bidder. All Bids shall be labeled:

“Sealed Bid - Village of Lexington, Tierney Park Improvements Project”

as well as the aforementioned bid opening date/time on the outside of the envelope.

If you are submitting a “No bid”, do not follow the above directions but send a letter to the Village of Lexington indicating the same.

Bids shall be mailed or delivered to Village of Lexington, Attn: Village Clerk, 7227 Huron Ave., Lexington, Michigan 48450 and must be in the Village’s possession **before** the stated deadline. **Faxed bids will not be accepted.**

5. RESPONSIVE BIDS

All pages and the information requested herein shall be furnished completely in compliance with instructions. The manner and format of submission is essential to permit prompt evaluation of all bids on a fair and uniform basis. Unless otherwise specified, the Village of Lexington reserves the right to accept or reject any individual item in the bid. Bidders may submit on any item or group of items, provided however, that the unit prices are shown as required. Accordingly, the Village reserves the right to declare as non-responsive and reject any incomplete bid if material information requested is not furnished, or where indirect or incomplete answers or information is provided. Alterations to the written requirements will negate any response.

6. BIDDER’S RESPONSIBILITY

It is **mandatory** that each bidder attend the pre-bid meeting, in person, at to be held at Tierney Park Restroom Building, on April 8, 2025 at 1pm to view the site, discuss the proposed work and fully acquaint themselves with conditions relating to construction and labor so that it may fully understand the facilities, difficulties and restrictions attending the execution of the work under the proposed contract. Bids submitted by bidders that do not attend the pre-bid meeting shall be rejected. Bidders shall thoroughly examine and be familiar with the drawings and contract documents related to the Project prior to bidding. Any apparent omissions, errors or discrepancies in plans or specifications shall be reported to the Village in ample time before the deadline to submit bids. The failure or omission of any bidder to receive and examine any form, instrument, addendum or other document, or to visit the site and acquaint himself with the conditions there existing, shall in no way relieve any bidder from any obligation with respect to its bid, or to the contract. The submission of a bid

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shall be taken as prima facie evidence that the bidder is familiar with the Project's specifications, contract documents, site conditions, facilities, restrictions and difficulties as well as any other items or information presented at the pre bid meeting.

7. PRICES BID

The prices bid shall cover the costs of any nature, incident to and growing out of the work, in explanation, but not in limitation thereof, the prices stated in the proposal by the bidder, shall include the cost of everything necessary for the performance and completion of the items bid in the manner and time prescribed, including the furnishing of all material, tools, equipment, transportation, labor, supervision, all costs on account of loss by damage or destruction of the work, unforeseen difficulties encountered, for settlement of damages, for replacement of defective work and materials, and for all else necessary therefore and incidental thereto.

8. NAME, ADDRESS, and LEGAL STATUS of the BIDDER

The name and legal status of the bidder, whether corporation, partnership, limited liability company, or individual, shall be stated in the bid. A corporation bidder shall give the state in which incorporated, a partnership bidder shall give all the names of the partners. A limited liability company shall give the state in which it is organized and shall give the names of all members holding an interest of 10% or more in the company. Partnership and individual bidders will be required to state in the proposal the names of all persons interested therein.

The place of residence of each bidder, or the office address in the case of a firm or company, with county and state must be given after his signature.

All bid documents shall be signed by an individual authorized to bind the bidder and witnessed by two witnesses who shall also sign. All bid documents shall be signed by the bidder, as follows:

A. Sole Proprietorship: Signature of sole proprietor in the presence of witnesses who shall also sign. Insert the words "Sole Proprietor" under the signature.

B. Partnership: Signature of all partners in the presence of witnesses who shall also sign. Insert the word "Partner" under each signature.

C. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures in the presence of witnesses who shall also sign. Insert the officer's capacity in which the signing officer acts, under each signature. If the bid is signed by officials other than the President and Secretary of the company, or the President/Secretary/Treasurer of the company, a copy of the by law or resolution of the Board of Directors authorizing them to do so must also be submitted with the bid in the sealed bid envelope.

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D. Limited liability company: Signature of a duly authorized manager or member of the company in their normal signatures in the presence of witnesses who shall also sign. Insert the signor's capacity in which the signing officer acts, under each signature. A copy of the articles of organization or operating agreement that confirms the authority of the signor to sign for the company shall also be provided.

9. QUALIFICATIONS OF BIDDER

The Village may make such investigations as it deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Village all such information and data for this purpose as the Village may request. Such information may include past performance records, list of available personnel, plant and equipment, description of work to be done simultaneously with the Village's Project, financial statement, or any other pertinent information. The Village reserves the right to reject any bid if the evidence submitted by, or investigation of such bidder, fails to satisfy the Village that such bidder is properly qualified and able to carry out the obligations of the contract and to complete the work contemplated therein. Conditional bids will not be accepted.

10. OFFICIAL DOCUMENTS

The Village of Lexington shall accept NO CHANGES to the bid document made by the bidder unless those changes are set out in the "Exceptions" provision of the authorized version of the bid document. It is the bidder's responsibility to acquire knowledge of any change, modifications or additions to the authorized version of the bid document. Any bidder who submits a bid and later claims it had no knowledge of any change, modifications or additions made by the Village to the authorized version of the bid document, shall be bound by the bid, including any changes, modifications or additions made by the Village to the authorized version of the bid, and if that Bidder fails to accept the bid award, the Village may pursue costs and expenses to re-bid the item from that bidder.

11. INTERPRETATION OF BID AND/OR CONTRACT DOCUMENTS

Any interpretation to a bidder regarding the bid and/or contract documents or any part thereof is valid only if given in writing by Edgewater Resources. Any information given orally, given by departmental contacts or others is not official and shall not be relied upon by the bidder. Explanations desired by bidders shall be requested from the Professional in writing to sfromson@edgewaterresources.com. If the Village determines explanations are necessary, a reply will be made in the form of a written addendum, which may be provided to other bidders. All addenda issued to bidders prior to date of receipt of proposals shall become a part of these specifications and all proposals are to include the work therein described. Each proposal submitted shall list all addenda by numbers which have been received prior to time scheduled for receipt of proposals. All inquiries shall be made within reasonable time prior to the stated deadline in order that a written response in the form of an addendum, if required, can be processed before bids are opened. Inquiries received that are not made in a timely fashion may or may not be considered.

12. CHANGES AND ADDENDA TO BID DOCUMENTS

Each change or addendum issued in relation to this bid will be on file with BidNet Direct. It shall be the bidder's responsibility to make inquiry as to the changes or addenda issued. All such changes or addenda shall become part of the contract and all bidders shall be bound by such changes or addenda.

13. SPECIFICATIONS

Unless otherwise stated by bidder, the bids will be considered as being in strict accordance with the Village's applicable standard specifications, and any special specifications outlined in the bid document. Reference to a particular trade name, manufacturer's catalogue, or model number are made for descriptive purposes to guide the bidder in interpreting the requirements of the Village, and should not be construed as excluding bids on other types or materials, equipment and supplies unless otherwise stated. However, the bidder, if awarded the contract, will be required to furnish the particular item referred to in the specifications or description unless departure or substitution is clearly noted and described in the bid. **The Village reserves the right to determine if equipment/product or service being bid is equal to the specified equipment/product or service requested.**

14. ALTERNATE BIDS

Bidders are cautioned that any alternate bid, unless requested by the Village, or any changes, insertions, or omissions to the terms and conditions, specifications, or any other requirements of this bid, may be considered non-responsive, and at the opinion of the Village, may result in rejection of the bid.

15. PRICING

Prices shall be stated in units of quantity where unit pricing is specified in the bid documents. In case of a discrepancy in computing the amount of the bid, the unit price bid will govern. All prices stated in the bid must be plainly written in legible figures. Illegibility of any figure or word in the bid may be sufficient cause for rejection of the proposal by the owner. Erasures or changes in the bid must be initialed by the bidder.

16. QUANTITIES

All quantities stated, unless indicated otherwise are estimates and the Village reserves the right to increase or decrease the quantity at the unit price bid as best fits its needs. If a contract item will need to be increased by more than 10%, a change order will need to be agreed upon before the work can proceed.

17. DELIVERY (if applicable)

Bids shall include all charges for delivery, packing, crating, installation, etc., unless otherwise stated in the bid document. All deliveries will be FOB: Delivered. General delivery hours are 8:00 a.m. to 4:00 p.m. Monday-Friday.

18. TAXES, TERMS AND CONDITIONS

The Village is exempt from Federal Excise, State Sales Tax, and Personal Property Tax. Please review The State of Michigan's REVENUE ADMINISTRATIVE BULLETIN 1999 – 2 for clarification <http://www.treas.state.mi.us/lawrules/rabs/1999/rab9902.htm>. The Village's tax number is 38-6007186. The payment terms shall be 30 days after the Village has reviewed and accepted monthly pay applications.

19. AWARD

The bid will be awarded to that responsible, responsive bidder whose bid, conforming to this solicitation, will be most advantageous and in the best interests of the Village, price, completion date and other factors considered as determined in the sole discretion of the Village. The Village reserves the right, in its sole discretion, to accept or reject any or all bids, in part or whole, and to waive informalities and minor irregularities in bids received. Unless otherwise specified in the bid document the Village reserves the right to accept any item in the bid on an individual basis. Bidders may submit bids on any item or groups of items provided unit prices are clearly shown and a notation is made on the bid document clearly indicating Bidder's intent.

The Village reserves the right to not award a contract to the low bidder. The Village reserves the right to not award a contract in response to this invitation to bid. The Village reserves the right to re bid all or parts of the Project. The Village prefers to have the project completed by June 30, 2026 and will have higher award criteria for this element of the work. The Contractor will need to enter the completion date which they believe the contract can be completed.

20. WITHDRAWAL OF BIDS

Bids may be withdrawn in person by a bidder, or authorized representative, provided their identity is made known and a receipt is signed for the bid, but only if the withdrawal is made prior to the stated bid deadline. No bid may be withdrawn for at least 90 days after bid opening except the successful company whose prices shall remain firm for the entire contract period. In case of error by the bidder in making up a bid, the Village may, by discretion, reject such a bid upon presentation of a letter by the bidder which sets forth the error, the cause thereof, and sufficient evidence to substantiate the claim.

21. DEFAULT CONDITIONS

In case of default by the bidder awarded a contract, the Village may procure the articles or services from other sources and hold the bidder responsible for any excess cost occasioned thereby. In case of error by the bidder relating to a contract, the Village may, by discretion, upon presentation of a written explanation by the bidder substantiating the error, reject the Contract and award to the next qualified bidder; such error may be subject to default conditions.

22. INFRINGEMENTS AND INDEMNIFICATIONS

The bidder, if awarded a contract, agrees to protect, defend and save the Village of Lexington, its officials, employees, insurers, departments and agents harmless against; any demand for payment for the use of any patented material, process, or device that may

enter into the manufacture, construction, or from a part of the work covered by either order or contract; and from suits or a charge of every nature and description (including attorney fees) brought against it or incurred by it, arising in any way out of any injuries or damages received or sustained by the parties by or from any of the facts of the contractor, the contractor's employees, or agents; from all liability claims, demands, judgments and expenses to persons or property occasioned, wholly, or in part, by the acts or omissions of the bidder, contractor, agents or employee.

23. INSURANCE REQUIREMENTS

The successful bidder (i.e. contractor) shall be required to provide proof of insurance coverage which is reasonably acceptable to the Village which shall, at a minimum, include the following:

- Workers' Compensation Insurance:** The contractor shall procure and maintain during the life of the contract, Workers' Compensation Insurance, including Employers' Liability Coverage, in accordance with all applicable statutes of the State of Michigan.
- Commercial General Liability Insurance:** The contractor shall procure and maintain during the life of the proposed contract, Commercial General Liability Insurance on an "Occurrence Basis" with limits of liability not less than \$1,000,000.00 per occurrence and \$3,000,000.00 aggregate combined limit for Personal Injury, Bodily Injury and Property Damage. Coverage shall include the following extensions: (A) Contractual Liability; (B) Products and Completed Operations; (C) Independent Contractors Coverage; (D) Broad Form General Liability Extensions or equivalent, if not already included; (E) Deletion of all Explosion, Collapse and Underground Exclusions, if applicable.
- Motor Vehicle Liability:** The contractor shall procure and maintain during the life of this contract Motor Vehicle Liability Insurance, including Michigan No-Fault Coverages, with limits of liability not less than \$3,000,000.00 per occurrence combined single limit for Personal Injury, Bodily Injury and Property Damage. Coverage shall include all owned vehicles, all non-owned vehicles and all hired vehicles.
- Additional Insured:** Commercial General Liability and Motor Vehicle Liability, as described above, shall include an endorsement stating that the following shall be *Additional Insureds*: The Village of Lexington and all elected and appointed officials, all employees and volunteers, all boards, commissions and/or authorities and board members, including employees and volunteers thereof. It is understood and agreed by naming the Village of Lexington as additional insured, coverage afforded is considered to be primary and any other insurance the Village may have in effect shall be considered secondary and/or excess.

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- Fuel System: The Fuel Handling System sub-contractor is required to provide Pollution Liability Insurance with limits not less than One million Dollars per occurrence and all other insurance AND CERTIFICATIONS that are required by the State of Michigan, Department of Environment, Great Lakes and Energy (EGLE) where required. Any Fuel Handling System sub-contractor hired, in addition to listing the Village as an additional insured to any insurance policy shall also list “the **State of Michigan, its departments, divisions, agencies, offices, commissions, officers, employees, and agents**” as an additional insured.

Cancellation Notice

Workers’ Compensation Insurance, Commercial General Liability Insurance, and Motor Vehicle Liability Insurance, as described above, shall include an endorsement stating that it is understood and agreed that Thirty (30) days Advance Written Notice of Cancellation, Ten (10) days for non-payment of premium, Non-Renewal, Reduction, and/or Material Change shall be sent to: Village of Lexington, Attn: Village Manager, 7227 Huron Ave., Lexington, Michigan 48450.

If any of the above coverages expire during the term of the contract, the contractor shall deliver renewal certificates and/or policies to the Village of Lexington at least Ten (10) days prior to the expiration date.

Proof of Insurance Coverage

The contractor shall provide the Village of Lexington at the time of execution of the contracts, copies of certificates and policies as listed below:

- Certificate of Insurance for Workers’ Compensation Insurance;
- Certificate of Insurance for Commercial General Liability Insurance;
- Certificate of Insurance for Vehicle Liability Insurance;
- Original policy, or binder pending issuance of policy, for Owners’ & Contractors’ Protective Liability Insurance;
- Certified Copies of all policies mentioned above.

24. GENERAL INFORMATION

The Village of Lexington is accepting bids for its Harbor Redevelopment Project.

Public Act 517 of 2012

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Public Act 517 of 2012 states that all public entities must require all companies submitting a bid on an request for proposals to certify that the company is not an Iran-linked business. Iran-linked businesses may not bid on the contract and each proposer **must** provide certification that they are not an Iran-linked business.

25. INSTALLATION

All items will be shipped via the bidder's delivery system. No items will be dropped shipped to the Village. The bidder will provide complete installation. The work site will be maintained in a clean and safe manner during installation. The bidder will remove all shipping containers, packaging.

26. SPECIFICATIONS AND PRICING

Bidder will provide assistance in all re-design if possible value add to best suit the needs of the Village. **Note – ALL DESIGN, DELIVERY AND INSTALLATION WILL BE DONE BY THE SUCCESSFUL BIDDER AT ZERO (0) ADDITIONAL COST TO THE VILLAGE.**

27. BID REQUIREMENTS AND SPECIFICATIONS

All bids shall comply with this invitation to bid, to all documents referenced herein, to all information and specifications presented at the pre bid meeting, and all addenda to any of the aforementioned documents. **Please refer to the attached Village of Lexington Harbor Redevelopment Project Scope of Work for Project specifications.**

28. FIRM PRICE GUARANTEE

All bid pricing will remain firm for at least 90 days after the bid opening. Pricing detailed by a successful bidder shall remain firm for the length of the project and until work is completed.

29. BONDS.

All bidders must include a 5% bid bond with their bid or other acceptable security for the bid. The successful bidder will be required to provide, at its cost, a performance bond and labor/material bond in the full amount of the bid from a licensed surety which is acceptable to the Village in the full amount of the bid and in conformance with the requirements of Michigan Public Act 213 of 1963. The Village may, in its sole discretion, consider other acceptable security such as a letter of credit.

26. GENERAL CONDITIONS.

The General Conditions for the contract for the Construction shall be A.I.A. Document 00 07 00 as revised by the Village and as attached hereto.

30. CONTRACT.

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The form contract used will be the AIA 00 04 00 as revised by the Village and as attached.
The chosen method of dispute resolution will be through the Sanilac County Courts.

28. GUARANTEE

All labor and materials are fully guaranteed for _____ years (minimum 3).

29. REFERENCES (Provide at least 3)

<u>Company</u>	<u>Contact Person</u>	<u>Phone #</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

30. CONTRACT TERMINATION

The Village reserves the right, upon thirty days written notice, to terminate the contract for a subject bid award for failure of bidder to comply with terms and conditions set forth herein. Nonperformance on the part of the bidder shall constitute breach of contract and shall nullify any and all contractual obligations between the seller and the purchaser.

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31. APPROVAL ACCEPTANCE/ACCEPTANCE OF SPECIFICATIONS

The undersigned herein submits this proposal and agrees to enter into an agreement, if awarded the contract, with the Village in accordance with the contract documents. In submitting this completed and signed proposal, it is understood that the right is reserved by the Village to reject any or all bids and to make such award that, in the opinion of the Village, is in the best interest of the Village.

NAME OF BIDDER: _____

BUSINESS ADDRESS OF BIDDER: _____

BUSINESS TELEPHONE # OF BIDDER: _____

AUTHORIZED SIGNATURE: _____

TITLE OF SIGNER: _____

DATE OF SIGNATURE: ____/____/____ FAX # _____

EMAIL: _____

Please contact Suzanne Fromson, PLA, Edgewater Resources with any questions regarding this document at sfromson@edgewaterresources.com, or by phone at 269-408-6387

32. PROPOSAL TIMELINE AND SCHEDULE

ACTIVITY	ANTICIPATED DATE
RFP Issuance	3/26/25
Mandatory Pre-Bid Meeting	4/8/25, 1:00PM
Questions Due	4/11/25, 5:00PM
Proposal Due Date	4/23/25, 1:00PM
Bid Opening	4/23/25, 2:00PM
Target Date for Vendor Selection	On or about 5/8/25
Target Date of Pre-Construction Meeting	On or about 9/2/25
Target Date for Construction Mobilization	On or about 9/15/25
Marina and MDNR Facility Closed for Season	10/1/25
Target Date to Finalize Construction	On or about 6/30/26

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33. PRE-BID MEETING

There will be a MANDATORY in-person pre-bid meeting on site at the time listed above with Village staff and Suzanne Fromson, Edgewater Resources.

Location: Existing Park Restroom at Tierney Park (not DNR Boater Services Restroom)
5451 Dallas St, Lexington, MI 48450

34. QUESTIONS

All correspondence, questions and additional information regarding this RFP shall be submitted, via e-mail, by deadline listed above, to project Professional: Suzanne Fromson, Edgewater Resources, LLC sfromson@edgewaterresources.com

35. EXAMINATION AND/OR PROCUREMENT OF CONTRACT DOCUMENTS

The contract documents are on file for inspection at Edgewater Resources. Copies of the contract documents may be obtained via e-mail free of charge or in hard copy format by personal pick-up at Edgewater Resources for a non-refundable fee of \$500.00 for each set of contract documents. To request a digital copy of the Contract Documents, Bid Form Excel Spreadsheet, or CAD file, send an email to project Professional: Suzanne Fromson, Edgewater Resources, LLC sfromson@edgewaterresources.com

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THIS PAGE MUST BE SIGNED AND MUST ACCOMPANY THE BIDDER BID.
CERTIFICATION OF COMPLIANCE – IRAN ECONOMIC SANCTIONS ACT
Michigan Public Act No. 517 of 2012

The undersigned, the owner, or authorized officer of the below-named company (the “Company”), pursuant to the compliance certification requirement provided in the Village of Lexington’s Request For Proposal (the “RFP”), hereby certifies, represents, and warrants that the Company (which includes its officers, directors and employees) is not an “Iran Linked Business” within the meaning of the Iran Economic Sanctions Act, Michigan Public Act No. 517 of 2012 (the “Act”), and that in the event the Company is awarded a contract by the Village of Lexington as a result of the aforementioned RFP, the Company is not and will not become an “Iran Linked Business” at any time during the course of performing any services under the contract.

The Company further acknowledges that any person who is found to have submitted a false certification is responsible for a civil penalty of not more than \$250,000.00 or two (2) times the amount of the contract or proposed contract for which the false certification was made, whichever is greater, the cost of the Village of Lexington’s investigation, and reasonable attorney fees, in addition to the fine. Moreover, any person who submitted a false certification shall be ineligible to bid on a request for proposal for three (3) years from the date the it is determined that the person has submitted the false certification.

Name of Company

Name and Title of Authorized Representative

Signature

Date

TIERNEY PARK RENOVATION
 VILLAGE OF LEXINGTON, MICHIGAN

TIERNEY PARK IMPROVEMENTS PROJECT

SECTION 00 04 00 – BID FORM

I. ARTICLE(S) and SERVICE

Having carefully examined the bid specifications contained herein; having carefully read the "REQUEST FOR PROPOSAL, GENERAL CONDITIONS, INSTRUCTIONS, AND INFORMATION: The Bidder proposes to provide the specified material(s), article(s), good(s), and service(s) at the prices listed in this proposal subject to all instructions, conditions, specifications and all attachments hereto.

Variances

II. BID PRICES

The proposal shall contain a completed price schedule and all information requested within this Request for Proposals, including any project variances. The contract will be awarded based on the criteria listed in the specifications, the variances, and the results of the completed price schedule.

Unit prices must be provided for the following (**Contractor is responsible for verifying quantities**):

BASE BID Unit Price Work					
Item	Description	Unit	Estimated Quantity	Unit Price	Extended Price
013100.01	Mobilization, Max 4%	LS	1	\$	\$
013100.02	General Conditions	LS	1	\$	\$
015526.01	Traffic Control	LS	1	\$	\$
020120.01	Tree Protection	FT	1,135	\$	\$
024100.01	Sidewalk Removal	SYD	1,384	\$	\$

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024100.02	Curb and Gutter, Rem	FT	2,870	\$	\$
024100.03	Restroom Removal, Complete	LS	1	\$	\$
024100.04	Timber Stairs, Rem	EA	2	\$	\$
024100.05	Boardwalk, Rem (FUTURE: NIC)	LS	1	\$ ---	\$ ---
024100.06	Steel Grate Path, Rem (FUTURE: NIC)	LS	1	\$ ---	\$ ---
024100.07	Timber Sidewalk, Rem	SYD	170	\$	\$
024100.08	Electrical Boxes, Rem	LS	1	\$	\$
024100.09	Light: Pedestrian, Rem	EA	7		
024100.10	Light: Bollard, Rem	EA	3	\$	\$
024100.11	Irrigation System, Rem	LS	1	\$	\$
024100.12	Regulatory Signs, Rem	LS	1	\$	\$
024100.13	Dumpster Enclosure, Rem (Salvage doors)	EA	1	\$	\$
024100.14	Fence, Rem	FT	30	\$	\$
024100.15	Footwash, Rem	EA	1	\$	\$
024100.16	HMA Surface Mill, Rem	SYD	3,808	\$	\$
024100.17	HMA, Rem	SYD	5,416	\$	\$
024100.18	Sanitary Line, Abandon	LS	1	\$	\$
024100.19	Structure, Rem	EA	2	\$	\$
024100.20	DR Structure Cover, Adj, Case 1	EA	4	\$	\$
024100.21	Steel Sculpture, Relocate	EA	1	\$	\$
024100.22	Tierney Bust, Relocate	EA	1	\$	\$

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024100.23	Flagpoles, Relocate	EA	3	\$	\$
024100.24	Landscape Boulders, Relocate	LS	1	\$	\$
024100.25	Tree, Rem 6 inch to 18 Inch	EA	25	\$	\$
024100.26	Tree, Rem 19 Inch to 30 Inch	EA	23	\$	\$
024100.27	Stump, Rem 6 inch to 18 Inch	EA	25	\$	\$
024100.28	Stump, Rem 19 Inch to 30 Inch	EA	23	\$	\$
024100.29	Topsoil Surface, Salv, 5 Inch (Approx 3,245 cyds)	LS	1	\$	\$
033000.01	Curb and Gutter, Conc, Det F3	FT	2,725	\$	\$
033000.02	Curb and Gutter, Conc, Det D1	FT	393	\$	\$
033000.03	Sidewalk, Conc, 4 Inch	SF	8,812	\$	\$
033000.04	Conc Pavt, Reinf, 6 Inch	SF	23,912	\$	\$
033000.05	Conc Pavt, Reinf, 6 Inch - Color with Exposed Agg	SF	3,325	\$	\$
033000.06	Sidewalk ADA Ramp Conc, 6 Inch	EA	9	\$	\$
033000.07	Detectable Warning Surface	EA	9	\$	\$
033000.08	Concrete Ramp at West Pavilion	EA	1	\$	\$
033000.09	Concrete Stairs at East Pavilion	EA	1	\$	\$
033000.10	Trench Drain	FT	102	\$	\$
033000.11	Footwash Drain	EA	2	\$	\$
055200.01	Steel Railing – Ramp at Pavilion, West	LS	1	\$	\$
055200.02	Steel Railing – Stairs at Pavilion, East	LS	1	\$	\$
069100.01	Timber Staircase	LS	1	\$	\$

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069100.04	Boardwalk Landing at Breakwater Connection (FUTURE: NIC)	SF	1,035	\$ ----	\$ ---
129300.01	Bench, New	EA	6	\$	\$
129300.02	Bench, Relocated (stored by Village)	EA	15	\$	\$
129300.03	Swing Bench	EA	4	\$	\$
129300.04	Picnic Table, Fixed	EA	6	\$	\$
129300.05	Picnic Table, Free-standing	EA	4	\$	\$
129300.06	Litter Receptacle	EA	6	\$	\$
129300.07	Grill	EA	6	\$	\$
129300.08	Ash Urn	EA	2	\$	\$
129300.09	Bike Rack	EA	8	\$	\$
129300.10	Dog Bag Dispenser	EA	2	\$	\$
129300.11	Dumpster Enclosure	LS	1	\$	\$
129300.12	Wheel Stop	EA	105	\$	\$
129300.13	ADA Parking Sign and Post	EA	9	\$	\$
129300.14	Regulatory Signs	EA	16	\$	\$
129300.15	Bollard	EA	8	\$	\$
129300.16	RV Pedestal	EA	4	\$	\$
129300.17	Bollard Lights	EA	16	\$	\$
129300.18	Bollard Lights w/ 120V power	EA	6	\$	\$
129300.19	Flagpole Uplight	EA	3	\$	\$
310000.01	Topsoil, 4 Inch	SYD	8,200	\$	\$

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312213.01	Machine Grading, Modified	LS	1	\$	\$
312500.01	Soil Erosion and Sediment Control	LS	1	\$	\$
321123.01	Aggregate Base, 8" depth	SYD	7,960	\$	\$
321216.01	HMA, 5E, 1 ½ Inch	TON	667	\$	\$
321216.02	HMA, 3E, 2 ½ Inch	TON	1,098	\$	\$
321216.03	Parking Lot Striping	FT	5,000	\$	\$
321216.04	Crosswalk	EA	6	\$	\$
321413.01	Crushed Stone Paving	SF	1,465	\$	\$
321420.01	Reinforced Turf Rings	SF	710	\$	\$
328400.01	Irrigation System, Complete	LS	1	\$	\$
329200.01	Seed, Fertilizer and Mulch	SYD	4,549	\$	\$
329210.01	Slope Restoration	SYD	450	\$	\$
329220.01	Shoreline Seed	SF	5,800	\$	\$
329300.01	Trees: 3" Caliper	EA	18	\$	\$
329300.02	Trees: Ornamental	EA	13	\$	\$
329300.03	Shrubs	EA	78	\$	\$
329300.04	Container Plants: Perennials/Ornamental Grasses	EA	1,440	\$	\$
329300.05	Mulch	SYD	91	\$	\$
329312.01	Rain Garden	SF	13,200	\$	\$
329312.02	Bio-Swale	FT	288	\$	\$
330010.01	Utility Conduit	LS	1	\$	\$

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330040.01	Bollard Lights, Foundation	EA	16	\$	\$
330040.02	Bollard Lights w/ 120V Power, Foundation	EA	6	\$	\$
331100.01	Site Electrical System, Complete	LS	1	\$	\$
331220.01	Water Service, 2 Inch	FT	390	\$	\$
331210.02	Water Service Connection, 2 Inch	EA	1	\$	\$
333000.01	8" Sanitary Sewer	FT	364	\$	\$
331310.01	Sanitary Sewer Leads and Cleanouts	FT	57	\$	\$
331320.01	Sanitary Manhole w/ Frame & Cover	EA	1	\$	\$
331320.02	Sanitary Manhole, Patch	EA	1	\$	\$
331320.03	Core and Seal, Sanitary Manhole	EA	1	\$	\$
331500.01	Restroom Building, Complete (includes Footwash and Footwash w Shower)	LS	1	\$	\$
331600.01	Pavilion Building, Complete	LS	1	\$	\$
332000.01	Marine Fuel Landside System Demolition	LS	1	\$	\$
332010.01	Marine Fuel System, Complete	LS	1	\$	\$
332010.02	Marine Fuel Connector, Complete	LS	1	\$	\$
Contingency Allowance		LS	1	\$75,000.00	\$75,000.00
TOTAL Base Bid Price (subject to final adjustment based on actual quantities)					\$

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ALTERNATE #1 Unit Price Work					
Item	Description	Unit	Estimated Quantity	Unit Price	Extended Price
069200.01	Timber Boardwalk, Complete	LS	1	\$	\$
TOTAL Alternate #1 Bid Price (subject to final adjustment based on actual quantities)					\$

ALTERNATE #2 Unit Price Work					
Item	Description	Unit	Estimated Quantity	Unit Price	Extended Price
129300.20	Play Zone Trees	LS	1	\$	\$
129300.21	Play Zone EWF Fall Surface	CY	30	\$	\$
129300.22	Play Zone Concrete Curb	LF	160	\$	\$
TOTAL Alternate #2 Bid Price (subject to final adjustment based on actual quantities)					\$

The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in Paragraph 5.01 of the Agreement Stipulated Price, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer.

FORM OF CONTRACT:
AGREEMENT BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

THIS AGREEMENT is by and between Village of Lexington (“Owner”) and
_____ (“Contractor”).

Owner and Contractor hereby agree as follows:

ARTICLE 1 – WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

- A. Remove existing parking lots.
- B. Remove existing restroom/pavilion building.
- C. Install storm water system.
- D. Update utilities.
- E. Construct new buildings.
- F. Install proposed pavement for parking and roads.
- G. Install new lighting.
- H. Install new landscaping.
- I. Install site amenities.
- J. Remove existing fuel tanks and install new fuel system.

ARTICLE 2 – THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: Village of Lexington, Tierney Park Improvements – SESC, Site clearing, Remove Building and Structures, Remove Bollard Lighting, Remove Landscaping, Install New Buildings, Install New Lighting Foundations and Landscape Lighting, Install New Storm Sewer System, Update Utilities, Install New Landscaping, Install New Pavement for Parking and Roads and associated site improvements. Install new marine fuel system and connections.

ARTICLE 3 – ENGINEER

- 3.01 The Project has been designed by Edgewater Resources, LLC.
- 3.02 The Owner has retained Edgewater Resources, LLC (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

- A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Contract Times: Dates*

- 1. The Base Bid Work will be substantially completed on or before June 30, 2026, and is subject to equipment availability, weather, workload and timing of stone from the vendor. The timelines for the project, will be discussed at the pre-construction meeting.

4.03 *Liquidated Damages*

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):
 - 1. Substantial Completion: Contractor shall pay Owner \$1,000 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.B above for Substantial Completion until the Work is substantially complete. Businesses can operate with safe access and parking.
 - 2. Liquidated damages for failing to timely attain Substantial Completion and final completion are not additive and will not be imposed concurrently.

4.04 *Special Damages*

- A. In addition to the amount provided for liquidated damages, Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.
- B. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.

ARTICLE 5 – CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract:

- A. For all Unit Price Work, an amount equal to the sum of the extended prices (established for each separately identified item of Unit Price Work by multiplying the unit price times the actual quantity of that item):

Unit Price Work					
Item No.	Description	Unit	Estimated Quantity	Unit Price	Extended Price
	Contractor shall fill out Bid Forms – Section 00 04 00				
Total of all Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities)					\$

The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in the following paragraph, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer.

Unit Price Work

- Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. The Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.
- Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
 - the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly (10% or more) from the estimated quantity of such an item indicated in the Agreement;
 - there is no corresponding adjustment with respect to any other item of Work; and

- Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with the following conditions. Applications for Payment will be processed by Engineer as provided below.

6.02 *Progress Payments*

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of the noted Unit Price Work. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. Applications for Payments:
 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
 2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
 3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.
- C. Review of Applications:
 1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
 2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on

Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under The noted Unit Price Work, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
- a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
- a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 6.02.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
- a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 6.02.C7, or has accepted defective Work pursuant to Paragraph 6.02.C8.
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

- e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

7. Owner May Correct Defective Work

- a. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- b. In exercising the rights and remedies under this Paragraph, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor, but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- c. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as setoffs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- d. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph

8. Acceptance of Defective Work

- a. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner

D. Payment Becomes Due:

- 1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner setoffs) will become due, and when due will be paid by Owner to Contractor.

E. Reductions in Payment by Owner:

1. In addition to any reductions in payment (setoffs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. Claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. The Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 6.02.C7, or has accepted defective Work pursuant to Paragraph 6.02.C8;
 - h. The Contract Price has been reduced by Change Orders;
 - i. An event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
 - j. Liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - l. There are other items entitling Owner to a set off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 6.02.C.2 and subject to interest as provided in the Agreement.

6.03 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

6.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

6.05 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately

functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall inspect that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 6.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

6.06 *Final Inspection*

- A. Upon written notice from the Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

6.07 *Final Payment*

- A. Application for Payment:
 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. The Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer), and other documents, Contractor may make application for final payment.
 2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;

- c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all disputes that Contractor believes are unsettled; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
 - 3. In lieu of the releases or waivers of Liens specified in Paragraph 6.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.
- B. Engineer's Review of Application and Acceptance:
- 1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any setoffs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 6.08. Otherwise, the Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.
- D. *Payment Becomes Due*: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

6.08 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.

- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the following Methods and Procedures.
1. Methods and Procedures
 - a. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this Article:
 - 1) A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
 - 2) Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents and arising after final payment has been made.
 - b. *Final Resolution of Disputes*: For any dispute subject to resolution under this Article, Owner or Contractor may:
 - 1) elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
 - 2) agree with the other party to submit the dispute to another dispute resolution process; or
 - 3) If no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction

6.09 Correction Period

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
1. correct the defective repairs to the Site or such other adjacent areas;
 2. correct such defective Work;
 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start

to run from an earlier date if so provided in the Specifications.

- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
 - 1. The Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose

6.10 *Progress Payments; Retainage*

- A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 30th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.
 - 1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract
 - a. 90 percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage. (10% retainage will be held until the project reaches 50% complete and at that time this value of retainage will be held until the complete of the project)
- B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 100 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 6.02.E, and less 200 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.11 *Final Payment*

- A. Upon final completion and acceptance of the Work in accordance with Paragraph 6.07 of the General Conditions, the Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 6.07.

ARTICLE 7 – INTEREST

- 7.01 All amounts not paid when due shall bear interest at the rate of 0 percent per annum.

ARTICLE 8 – CONTRACTOR’S REPRESENTATIONS

- 8.01 In order to induce Owner to enter into this Contract, Contractor makes the following representations:
- A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.
 - B. Contractor has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - C. Contractor is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
 - D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.
 - E. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (3) Contractor’s safety precautions and programs.
 - F. Based on the information and observations referred to in the preceding paragraph, the Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
 - G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
 - H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
 - I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
 - J. Contractor’s entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.
 - K. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as

Technical Data entitled to limited reliance pursuant to Paragraph 8.01.K.I.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 8.01.K.I.H shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

1. Hazardous Environmental Conditions at Site
 - a. *Reports and Drawings*: The Supplementary Conditions identify:
 - 1) those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 - 2) Technical Data contained in such reports and drawings.
 - b. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 - 1) the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 - 2) other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 - 3) any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
 - c. The Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
 - d. The Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
 - e. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing).

Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with the Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor with the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition and impose a set-off against payments to account for the associated costs.

- f. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- g. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- h. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in EJCDC Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with EJCDC Article 8.
- i. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 8.01.K.1.b, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 8.01K.1.h shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- j. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of

Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- k. The provisions of Paragraphs EJCDC 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site
- L. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate the Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 Contents

- A. The Contract Documents consist of the following:
 - 1. This Agreement (pages 1 to 18, inclusive).
 - 2. Specifications as listed in the table of contents of the Project Manual.
 - 3. Drawings consisting of 66 sheets with each sheet bearing the following general title: Tierney Park Improvements Project.
 - 4. Addenda (numbers ■ to ■, inclusive).
 - 5. Exhibits to this Agreement (enumerated as follows):
 - a. Contractor's Bid (pages ■ to ■, inclusive).
 - 6. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
 - a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.
- B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 9.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

- A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 *Severability*

- A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10.05 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
 1. “corrupt practice” means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 2. “fraudulent practice” means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 3. “collusive practice” means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 4. “coercive practice” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on _____ (which is the Effective Date of the Contract).

OWNER:

CONTRACTOR:

Village of Lexington _____

By: _____

By: _____

Title: _____

Title: _____

(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____

Attest: _____

Title: _____

Title: _____

Address for giving notices:

Address for giving notices:

7227 Huron Avenue, Suite 100 _____

Lexington, MI 48450 _____

License No.: _____
(where applicable)

(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)

NOTE TO USER: Use in those states or other jurisdictions where applicable or required.

VILLAGE OF LEXINGTON
TIERNEY PARK IMPROVEMENTS PROJECT

SECTION 00700 – GENERAL CONDITIONS

ARTICLE I - Definitions/Glossary:

Addenda – Written instruments that are used by the Owner and/or Engineer to incorporate interpretations or clarifications, modifications and other information into the Bidding Documents. An Addendum issued after Bid opening to those Bidders who actually submitted a Bid, for the purpose of re-bidding the Work without re-advertising, is referred to as a post-Bid Addendum.

Alternate – Refers to work specified in the Bidding Documents, separate from the Base Bid Price, which the owner may elect to add or deduct from the base bid.

Bid – Written offer by the Bidder for the Work, as specified, which designates the Bidder's Base Bid and Bid Prices for all Alternates.

Bidder – The Person acting directly, or through an authorized representative, who submits a Bid to the Owner.

Change Order – A written order issued and signed by the Owner, which amends the Contract Documents for changes in the Work or an adjustment in Contract Price and/or Contract Time.

Contract Time(s) – The Contract Times for the entire Work are the periods allowed, including authorized adjustments, for Substantial Completion and final completion of the Work. The Contract times for a designated portion of the Work are the periods allowed for Substantial Completion and final completion of any such portion of the Work, as specified in the Contract Documents.

Contractor – Business enterprise with which the Owner has entered into the Contract.

Drawings – Part of the Contract Documents graphically showing the Work.

Final Completion – The date at which the punch list and all other outstanding construction issues (including documentation) have been completed to the Owner's satisfaction so that final payment and close-out of the project can occur.

Hazardous Material – Asbestos containing materials (ACM), Polychlorinated Biphenyls (PCBs), petroleum products, Lead, or such construction materials as paint thinners, solvents, gasoline, oil, etc..., and any other like material the manufacture, use, treatment, storage, transportation or disposal of which is regulated by federal, State or local Laws governing the protection of public health, natural resources or the environment.

Notice to Proceed – Written notice directing the Contractor to commence with construction activities and establishing the start date of the Contract (and establishing the Alternates accepted by the Owner).

Owner – The Village of Lexington, with whom the Contractor has entered into the Contract and for whom the Work is to be provided.

Progress Schedule – Work Schedule that shows the Contractor's approach to planning, scheduling and execution of the Work.

Shop Drawings – Includes drawings, diagrams, illustrations, standard schedules, performance charts, instructions and other data prepared by or for the Contractor to illustrate some part of the Work, or by a Supplier and submitted by the Contractor to illustrate items of material or equipment.

Soil Erosion and Sedimentation Control – The planning, design and installation of appropriate Best Management Practices designed and engineered specifically to reduce or eliminate the off-site migration of soils via water runoff, wind, vehicle tracking, etc.

Specifications – Parts of the Contract Documents organized into Divisions. "Technical Specifications" means Divisions of the Specifications consisting of technical descriptions of materials, equipment, construction systems, standards and workmanship.

Subcontractor – A person having an agreement with the Contractor to provide labor and furnish materials and/or equipment for incorporation into the Work.

Submittals – Includes technical Submittals, Progress Schedules and those other documents required for submission by the Contract Documents.

Substantial Completion – The Work, or a portion of the Work designated in the Contract Documents as eligible for use for its intended purpose by the Owner with the exception of minor items of repairs and/or touch up which do not affect the Owners use of the Project. (The Minor list of incomplete items is identified by the Owner & Engineer called the Punch List.)

Supplier – A manufacturer or fabricator, a distributor, or a material person or vendor representing a manufacturer or fabricator, who has an agreement with the Contractor to furnish materials and/or equipment.

Work – The entire completed Construction required by the Contract Documents. The Work results from furnishing and performing all services, obligations, responsibilities, management, supervision, labor, materials, equipment, construction equipment, general conditions, permits, taxes, patent fees and royalties, testing, inspection and approval responsibilities, warranties, temporary facilities, small tools, field supplies, Bonds, insurance, mobilization, close-out, overhead and all connections, devices and incidental items of any kind or nature required and/or made necessary by the Contract Documents.

ARTICLE 2 - The Contract: The Contract is inclusive of all written and graphic documents that form the legal agreement between the Owner and the Contractor consisting of this document, completed and signed Bid, terms and conditions of the Contract, Drawings, specifications, Addenda, Notice of Award, Notice to Proceed and Contract Change Orders.

ARTICLE 3 – Interpretations: The Engineer has the responsibility of making “Contract” interpretations. Any questions or clarifications requested by the Contractor must be submitted in writing to the Engineer.

ARTICLE 4 - Examination of Premises: The Bidder shall familiarize themselves with the existing conditions of the project work site. The Bidder must take their own field measurements and be responsible for the correctness of same. If the Contractor notes any deviations between the existing project work site and the Specifications/plans, the Contractor shall properly notify the Owner and/or the Engineer in writing. Failure to notify the Owner and/or the Engineer will constitute the Contractor's acceptance of the existing project work site conditions.

ARTICLE 5 - Materials & Equipment (Substitutions, Submittals): Unless otherwise specified, all materials shall be new and of the best grade of their respective kinds for the purpose of the Work. Whenever an article, material, or equipment is specified by name, a substitute of equal qualifications may only be used upon the written approval of the Engineer. The Contractor will be required to use alternatives to landfills for waste disposal such as reuse or recycle of any waste materials to the extent practical. Prior to starting Work, the Contractor must submit to the Engineer and receive approval for all required samples and all other technical Submittals that are required by the Contract Documents.

ARTICLE 6 - Other Contracts: During the Contract Time, the Owner may contract for other work and/or self-perform work at or adjacent to the project site. In doing so, the Owner will coordinate the operations of the Contractor and the other work. The Contractor must coordinate its activities with the interfacing work, and must provide proper and safe access to the site for the other Owner -contracted work.

ARTICLE 7 - Protections of Work and Property (Cutting & Patching): The Contractor must do all cutting, fitting or patching of the Work that may be required to assemble all components, or make the new Work join with the existing surface and materials. The Contractor must take proper precautions so as not to endanger any existing conditions or Work in progress. The Contractor must not cut or alter existing structural members or foundations unless specifically required by the Contract Documents. Openings cut in exterior walls and roofs for installation of materials or equipment must be waterproofed by appropriate, approved materials and methods. All adjacent finished surfaces that are damaged by the new Work must be patched and repaired with materials matching existing surfaces. Joints between patched and existing materials must be straight, smooth and flush. Workers applying patching material must be skilled in the appropriate trade required for the specific installation.

ARTICLE 8 – Insurance: No work connected with this Contract shall be started until the Contractor has submitted evidence to the Owner that (i) all workers are insured to protect him/her from claims for damages for personal injury or death which may arise from operations under this Contract and that (ii) he/she is covered by the following types and amounts of insurance:

- A. Commercial General Liability Insurance with a limit of not less than \$700,000 each occurrence and \$5,000,000 Aggregate for Bodily Injury and Property Damage. If such CGL insurance contains a general aggregate limit, it must apply separately to this project.

The Contractor must list the Village of Lexington, its departments, divisions, agencies, offices, commissions, officers, employees and agents and Edgewater Resources, LLC as ADDITIONAL INSUREDS on the Commercial General Liability policy.

- B. Contractor must have vehicle liability insurance for bodily injury and property damage with a limit of not less than \$1,000,000 each occurrence and as required by law on any auto including owned, hired and non-owned vehicles used in the Contractor's business.

The Contractor must list the Village of Lexington, its departments, divisions, agencies, offices, commissions, officers, employers and agents as ADDITIONAL INSUREDS on the vehicle liability policy.

- C. Worker's disability compensation, disability benefit or other similar employee benefit act with minimum statutory limits. NOTE:
- (1) If Contractor has qualified as a self-insurer, separate certification must be furnished that Contractor has approval to be a self-insurer;
 - (2) Any citing of a policy of insurance must include a listing of the States where that policy's coverage is applicable; and
 - (3) This provision must not be applicable where prohibited or limited by Indiana law.
- D. Employer's Liability Insurance with the following minimum limits:

\$1,000,000 each accident
\$1,000,000 each employee by disease
\$1,000,000 aggregate disease

Liability Insurance must be endorsed to list as additional insureds, the Engineer's consultants and agents. Worker's Compensation, Employer's Liability Insurance and all other liability insurance policies must be endorsed to include a waiver of rights to recover from the Owner, Engineer, and the other additional insureds. The Contractor's liability insurance must remain in effect through the Correction Period and through any special correction periods. For any employee of the Contractor who is resident of and hired in Indiana, the Contractor must have insurance for benefits payable under Indiana's Worker's Compensation Law. For any other employee protected by Worker's Compensation Laws of any other state, the Contractor must have insurance or participate in a mandatory state fund, where applicable, to cover the benefits payable to any such employee. These requirements must not be construed to limit the liability of the Contractor or its insurers. The Owner does not represent that the specified coverage or limits of insurance are sufficient to protect the Contractor's interests or liabilities.

Partial payments shall not relieve the Contractor from full responsibility for any damage which may result from any cause including fire or other casualty until completion of the Contract and final payment. Any casualties shall not relieve the Contractor from performing the Contract. Insurance Companies must have a rating of A- or better as listed by A.M. Best Company, <http://www.ambest.com>. The Village of Lexington must be named as an additional insured.

ARTICLE 9 - Changes in the Work (Unit Prices/Allowances): The Contractor shall make changes in the contracted Work only as ordered in writing by the Owner. The Contractor shall submit the proposed

change to the Engineer including description, justification, specifications and cost information. If the Engineer approves, the requested change will go to the Owner for final approval. The Owner reserves the right to increase or decrease the quantities of the Work to be performed at the Unit Price by amounts up to 100% of the listed estimated quantities. On extra work authorized by the Owner, allowance for overhead and profit markups by the Contractor shall not exceed 10% of the cost of Work involved if work is performed by their own forces and up to 5% if work is performed by Subcontractors. However, if work is to be performed by lower tier Subcontractors, the lowest tier Subcontractor performing the work may charge a fee up to 10% of the work involved, plus intermediate Subcontractors must share a maximum fee up to 5% of the lowest tier Subcontractor's cost excluding fees. In no situation shall the total markups for the Contractor and the Subcontractors exceed 20% of the actual work performed. If a dispute arises between the Owner and Contractor on an adjusted price, the Contractor must continue the Work with due diligence during the dispute/disagreement.

ARTICLE 10 - Termination/Disputes/Claims: The Owner may elect to terminate all or any part of the Work if the Contractor fails to complete the Work, or a specified part of the Work, within the corresponding Contract Time; fails or refuses to supply sufficient management, supervision, workers, materials or equipment; or otherwise fails to prosecute the Work, or any specified part of the Work, with the diligence required to comply with the Contract Time(s); the Contractor persistently disregards the authority of the Engineer or violates or disregards a provision of the Contract Documents or the Laws of any Political Subdivision with jurisdiction; or is found to be in violation of any nondiscrimination requirements imposed by Law; at any time, the Contractor, Subcontractor or Supplier is in violation of unfair labor practices prohibited by Section 8 of Chapter 327 of the National Labor Relations Act, 29 U.S.C. 158; or the Contractor violates or breaches any material provision of the Contract Documents. The Owner may, without cause and without prejudice elect to terminate any part of the Work, or the Contract in whole or in part, as the Owner may deem appropriate for its convenience or lack of funding. In the case that the Owner terminates the Contract for its convenience or lack of funding, the Contractor must protect and maintain the Work to make reasonable and diligent efforts to mitigate the cost of the Contract services rendered before the effective date of termination. Claims by the Contractor must be submitted to the Engineer and Owner for review. The Contractor must carry on the Work with due diligence during all disputes or disagreements. The recommendation from the Engineer will be the final and binding claim resolution unless the Contractor elects to file suit in the Indiana Court of Claims within 30 Calendar Days after the date of the Engineer recommendation for claim resolution.

ARTICLE 11 – Payment Requests and Payments: Each Application for Payment shall be delivered to the Engineer no later than the 30th day of the month and shall include all work completed as of the 25th day of the month. Final Application for Payment shall not be less than ten percent (10%) of the total Contract amount. The Contractor must make their requests in written form and attach all backup information as requested by the Engineer and/or the Owner. Incomplete, inaccurate, or inadequate submittals will be returned to the Contractor.

ARTICLE 12 - Regulatory Requirements: Contractor shall comply with all federal, state, and local laws, ordinance rules, regulations, orders, codes, permits, and other legally enforceable requirements, including

the Occupational Health and Safety Act. Contractor shall give notice and pay all royalties, permit fees, and Indiana sales and use taxes.

ARTICLE 13 – Indemnification: To the fullest extent permitted by law, the Contractor shall defend, indemnify and hold harmless the Owner together with its directors, officers, employees, assignees, agents and shareholders (hereinafter collectively called the “Indemnified Parties”), from and against all claims, demands, suits, obligations, liabilities, damages, losses and judgments, including costs and expenses related thereto (including, but not limited to, reasonable attorney’s fees and expenses and any obligation or liability for loss of use or any other incidental or consequential damages, and all fees and expenses incurred by the Indemnified Parties in establishing the right to indemnification hereunder), which may be asserted against, suffered by, charged to or recoverable from the Indemnified Parties by reason of the Contractor’s performance of this agreement.

ARTICLE 14 - Temporary Facilities: The Contractor must furnish and install all temporary facilities and controls required to perform the Work, must remove them from Owner’s property upon completion of the Work, and the grounds and existing facilities must be restored to their original condition. If utilities are available in the area where Work will be performed, the Contractor will not be charged for reasonable use of these services for the construction operation. The Contractor must pay the costs for installation and removal of any temporary connections including necessary safety devices and controls. Use of utility services must not disrupt or interfere with operations of the Owner. The Contractor must provide and maintain a sufficient number of portable temporary toilets in locations approved by the Owner, use of the Owner’s toilet facilities is subject to the Owner’s approval. The Contractor must comply with all federal, State and local code requirements and must maintain the temporary toilets in a sanitary condition at all times and must remove them when the Work under this Contract is complete. At the beginning of the Work, the Contractor may provide a field office and temporary storage building at the site in a location acceptable to the Owner.

ARTICLE 15 – Testing: The Contractor must assume full responsibility for any testing, inspection, or approvals required to meet code requirements as indicated in the Contract Documents, and as required by material or equipment Suppliers. The Contractor is responsible to make access provisions for all testing and inspections as required. The Owner may contract an independent testing company for certain quality assurance testing. A copy of all reports must be submitted to the Engineer.

ARTICLE 16 - Contract Time (Schedules): The Contractor shall start the Work on the date established in the Notice to Proceed and shall continue the Work until completed. The Contractor shall submit a construction schedule in a form indicating start dates and finish dates for the total Work and all significant activities of the Work. Normal business working hours are Monday - Friday, 8:00 a.m. - 5:00 p.m. C.S.T., except for State holidays.

ARTICLE 17 - Safety/Cleaning/Working Conditions: The Contractor and its Subcontractors/Suppliers must comply with all applicable federal, State and local laws governing the safety and protection of persons or property. The Contractor is solely responsible for initiating, maintaining and supervising all safety precautions. The Contractor must remove all scrap or removed material, debris or rubbish from the

project work site, including but not limited to roadways, sidewalks, ingress and egress locations, at the end of each working day and more frequently as required. The Contractor cannot discard materials on the grounds of the Owner without the express permission of the Owner. No salvage or surplus material may be sold on the premises of the Owner. No burning of debris or rubbish is allowed. Before final acceptance by the Owner, the Contractor must clean all of the Work and existing surfaces, building elements and contents that were soiled by their operations and make repairs for any damage or blemish that was caused by the Work. The Contractor must furnish, install and maintain as long as necessary and remove when no longer required adequate barriers, warning signs or lights at all dangerous points throughout the Work for protection of property, workers and the public. The Contractor must maintain at the site one copy of material safety data sheets (MSDS), one copy of all as-built/record documents and approved Submittals, clarifications and interpretations.

ARTICLE 18 – Supervision: Contractor shall enforce good order among the workforce and shall not employ any disorderly, intemperate, or unfit person or anyone not skilled in the work assigned to him/her. The Contractor shall employ a competent person having authority to act for him who shall be at the worksite at all times when work is being done at the site. He shall have the Contract Documents, plans/Drawings, Specifications and approved Shop Drawings available on the site at all times.

ARTICLE 19 - Project Closure (Record Documents, Guarantees, Warrantees): The Contractor must notify the Engineer when the Work is substantially complete. If the Engineer agrees that the project is Substantially Complete, a punch list will be developed. The Contractor must complete all punch list items by an agreed upon correction period. The Contractor must prepare and submit the following documentation before requesting final inspection or final payment: final operating and maintenance manuals, warranties, inspection certificates, as-built/record documents, and complete all other Contract requirements, as required by the contract documents.

ARTICLE 20 - Subcontractors/Suppliers/Assignments: The Owner assumes no contractual obligations to anyone other than the Contractor. The Contractor cannot assign his contract responsibilities to others. The Owner reserves the right to reject or revoke, for its convenience, any Subcontractor/Supplier. Work performed by any Subcontractor or Supplier must comply with all contract requirements.

ARTICLE 21 - Hazardous Materials/Environmental Requirements: If the Contractor encounters material reasonably believed to be Hazardous Material, which was not described in the Bid Documents and was not generated or brought to the site by the Contractor, the Contractor must immediately stop all affected work, give written notice to the Owner of the conditions encountered, and take appropriate health and safety precautions in accordance with all federal, State and local laws. Upon receipt of the notice, the Owner will investigate the conditions and may stop the Work and terminate the affected Work or the Contract for convenience, may contract others to have the Hazardous Material removed or rendered harmless, or issue a written Contract Change Order to amend the Contract Price/Time. If the Hazardous Material is brought to the site by the Contractor or as a result in whole or in part from its violation of any law covering the use, handling, storage, disposal of, processing, transport and transfer or from any other act or omission within its control, the Contractor is responsible for the delay and costs to clean up the site, remove and render harmless the Hazardous Material to the satisfaction of the Owner

and all political subdivisions with jurisdiction. The Contractor and its Subcontractors/Suppliers must comply with all applicable federal, State and local environmental laws, standards, orders or requirements including but not limited to the National Environmental Policy Act of 1969, as amended, Clean Air Act, as amended, Clean Water Act, as amended, Safe Drinking Water Act, as amended, Pollution Prevention Act, as amended, Resource Conservation and Recovery Act, as amended, National Historic Preservation Act, as amended, and Energy Policy and Conservation Act and Energy Standards for Buildings, except Low-Rise Residential Buildings, ANSI/ASHRAE/IESNA Standard 90.1-1999.

ARTICLE 22 - Security Clearances: Contractor must comply with all special security requirements of the Owner where work is to be performed. Access to and egress from the buildings and grounds must be via routes specifically designated by the Contract Documents. All security clearances from the Owner where work is being performed must be obtained prior to starting Work. Contractor responsible for maintaining and returning an security key cards/fobs to the Owner following completion of the work.

ARTICLE 23 - Defective Work: Defective work must be replaced at the cost of the Contractor. If adjacent work is damaged by the removal and replacement of defective work and/or products, the Contractor shall restore these areas to their original condition at the Contractor's expense. Defective work may include poor workmanship, work not meeting code requirements or the requirements of the Contract Documents, or work not installed per manufacturer's requirements. The Contractor may also be held responsible for time delays or added costs to the Owner caused by the repair/replacement of defective work.

ARTICLE 24 - Soil Erosion and Sedimentation Control: All Work under this Contract must meet the storm water management requirements of the project and comply with all applicable Soil Erosion and Sedimentation Control (SESC) rules and regulations and specific provisions for same within the Contract Documents.

ARTICLE 25 - Warrantees/Guarantee: The Contractor must furnish the Owner with a written guarantee to remedy any defects due to faulty materials or workmanship for the specified warranty period. The manufacturer warranties for materials and equipment, as specified, must be appropriately transferred to the Owner.

ARTICLE 26 – Electric Power Disruption: The Contractor must coordinate with the Owner and other impacted entities, if power needs to be shut down for safe installation of the proposed improvements.

SUPPLEMENTARY CONDITIONS

The following conditions must supplement the General Conditions:

- I. See Drawings and Specifications.

VILLAGE OF LEXINGTON
TIERNEY PARK IMPROVEMENTS PROJECT

SECTION 01000 – CONTRACT SPECIFICATIONS

I. COORDINATION

- A. It shall be the full responsibility of the Contractor to coordinate and expedite all phases of his work, including his subcontractors. All other trades, subcontractors and/or separate contractors shall cooperate fully with the General Contractor.
- B. The General Contractor shall be kept informed of the progress of all his subcontractors, including separate contractors and shall notify the Engineer of any lack of progress immediately.
- C. Total completion of this project is the responsibility of the General Contractor. The General Contractor shall coordinate the work of the various contractors and subcontractors and shall notify them when portions of construction have reached the state requiring installation of their work or when materials are to be furnished and/or installed by them.
- D. The General Contractor shall give his personal supervision to work or provide a General Superintendent acceptable to the Owner and Engineer. The Contractor shall be responsible for basic layout work and for materials, workmanship, transportation, scaffolding, tools, utensils, etc., for the complete and substantial erection of everything shown and described and shall be responsible for obstructions to streets, drives, etc. Subcontractors shall provide adequate number of Foreman or Assistant superintendents to supervise their subdivisions of work. Such men shall be thoroughly experienced and capable of handling the crafts and type of work under their supervision.
- E. The General Contractor shall provide and maintain his own scaffoldings, ladders, work platforms and the like for access to various parts and levels as necessary for erection and completion of this work and the work of his subcontractors and other contractors. The Owner may provide a temporary floating work platform to support the work at their discretion and subject to availability.

2. FIELD ENGINEERING

CONTRACTOR and SUB-CONTRACTOR Responsibilities:

- A. CONTRACTORS shall visit the site of the work, compare the drawings and specifications with any work in the place, and inform themselves of all conditions, including other work, if any, being performed. Failure to visit the site will in no way relieve the CONTRACTOR from the necessity of furnishing any material or performing any work that may be required to complete the work in accordance with the Contract Documents.
- B. CONTRACTORS shall be responsible for the correct installation of his work to comply with the construction drawings and specifications.

- C. CONTRACTORS shall notify the ENGINEER of any discrepancies in the Contract Documents prior to performing the work.
- D. CONTRACTORS shall have a copy of the Contract Documents on the site at all times during the performance of the work.
- E. CONTRACTORS shall immediately locate all general reference points and take such action as is necessary to prevent their destruction; lay out their work and be responsible for all lines, elevations and measurements of buildings, grading, paving, utilities and other work executed by him under the Contract. He must exercise proper precaution to verify figures shown on drawings before laying out work and will be held responsible for any error resulting from his failure to exercise such precaution. He shall maintain at the work site at all times.
- F. CONTRACTORS shall verify grades, lines, levels, locations, volumes and dimensions as shown on the drawings and report any errors or inconsistencies to the ENGINEER before commencing work. Starting of work by the CONTRACTOR shall signify his acceptance.

III. SUBMITTALS

- A. The CONTRACTOR is to inform the ENGINEER on the morning of each day that work will not be performed on site because of inclement of threatening weather and shall keep a detailed log of days worked. This information will be used to determine possible extensions of time, if applicable.
- B. Contractor is responsible for submitting all product information and shop drawings referenced in the plans and specifications for review and approval prior to ordering.

IV. CONSTRUCTION FACILITIES & TEMPORARY STORAGE

A. TEMPORARY ELECTRICAL SERVICE

Contractor may use the Owners existing electrical supply for operating tools and charging. The General Contractor shall provide temporary electrical service for use of all trades and any necessary lighting or power incidental to the construction and pay for same as needed beyond that provided by the Owner.

The necessary extension cords and/or adapters required in addition to the above wiring shall be provided by each Contractor or Subcontractor requiring the same.

C. TEMPORARY LIGHTING

Do not reuse materials used for temporary service in permanent installation unless specifically approved by the Engineer. Provide adequate artificial lighting for all areas of work when natural light is not adequate for work.

D. TEMPORARY SANITARY FACILITIES

The CONTRACTOR shall provide and maintain a State Board of Health approved chemical toilet for the use of all workmen of all trades. The toilet shall be placed in an inconspicuous place, kept clean and removed when no longer needed.

E. TEMPORARY FIRST AID FACILITIES

All CONTRACTORS shall comply with the requirements of the "Manual of Accident Prevention in Construction", Associated General Sub-contractors of America, Inc., latest edition, Section 2, First Aid, and have on the site a first aid kit, dustproof, protected from heat and moisture and containing, as a minimum, the first aid items listed according to the number of employees.

F. MATERIAL STORAGE

If materials likely to be damaged by the weather are to be stored at the site, the Contractor shall provide on the premises where directed, suitable watertight storage shelters of sufficient size, having floors raised at least 6" above the ground on heavy joists or sleepers, in which he shall store all materials required on the site at one time.

The storage area is to be in a location that will not interfere with the construction operations. Should the area available not be sufficient for full storage of his materials and equipment, the Contractor will be required to provide arrangements elsewhere at his own expense, and adequately covered by insurance.

The Contractor is fully responsible for the security of their respective materials and equipment.

G. FENCES

Existing fences which interfere with the work shall be removed by the CONTRACTOR and restored to their original condition when the work is completed, unless the Contract Documents indicate otherwise.

H. TREE AND PLANT PROTECTION

It is the responsibility of the CONTRACTOR to protect all trees, shrubs, lawns, etc. not specifically designated for removal by the OWNER or ENGINEER.

H. BARRIERS AND ENCLOSURES

a. The CONTRACTOR shall provide all temporary sidewalks, barricades and safeguards together with sufficient lighting during periods when the work is not in progress. Such protection shall be subject to approval of the OWNER or ENGINEER. However, failure of the OWNER or ENGINEER to supervise such protection shall in no way relieve the CONTRACTOR of his responsibility according to the laws of this State and OSHA.

b. The CONTRACTOR shall be responsible for the erection and maintenance of all barricades, guard rails, lights and sign necessary for public safety and convenience. All

hazards within the limits of the work or detour around the work must be marked with well-painted well-maintained barricades, lanterns, torches, flares, reflectors, electric lights, flashers, or caution, warning and directional signs in sufficient quantity and size to adequately protect life and property. These safeguards shall be moved, changed, increased or removed as required during the progress of the work to meet changing conditions.

c. Barricades shall be placed in front of and around all excavations, openings, obstructions or construction areas so as to clearly define such areas to both drivers of vehicles and pedestrians. Whenever practical, the barricades shall be placed within three to six feet of the excavation or obstruction, and so placed that headlight beams of approaching vehicles will strike the barricades and reflecting devices head on.

d. The CONTRACTOR shall also comply with "Occupational Safety and Health Act" requirements issued by the Federal Government and/or adopted by the State, and local laws, rules and regulations, as they apply.

e. The OWNER reserves the right to remedy any neglect on the part of the CONTRACTOR as regards the protection of the work and public after twenty-four hours notice in writing except in case of emergency when it shall have the right to remedy any neglect without due notice and in either case to deduct the cost of such remedy from any money due or to become due the CONTRACTOR.

f. The CONTRACTOR is responsible for provide any and all safety boats, life jackets, and or buoys for the safety of their employees. Any use of the OWNER's equipment is at the OWNER's discretion and subject to availability.

I. PROTECTION OF WORK & PROPERTY

The OWNER will not be responsible for security on the site of the work. Each CONTRACTOR will be held responsible for loss or injury to persons or property where his work is involved and shall provide (if he deems it necessary) such watchmen and take such other precautionary measures as he may deem necessary to protect his own interests.

J. STORAGE AND PROTECTION

The CONTRACTOR shall provide protection against vandalism, rain, wind, storms, cold or heat so as to maintain all work, materials, apparatus, equipment, and fixtures incorporated in the work or stored on the site, free from injury or damage. At the end of the day's work, the CONTRACTOR shall cover all new work likely to be damaged. Items, which require dry storage, such as electrical controls and motors, shall be stored in a dry building and not under tarps.



PERFORMANCE BOND

CONTRACTOR *(name and address):*

SURETY *(name and address of principal place of business):*

OWNER *(name and address):*

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location):*

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract):*

Amount:

Modifications to this Bond Form: None See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal *(seal)*

Surety's Name and Corporate Seal *(seal)*

By: _____
Signature

By: _____
Signature *(attach power of attorney)*

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the

Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2 additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than

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the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be

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received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:



PAYMENT BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*:

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location)*:

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:

Amount:

Modifications to this Bond Form: None See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

_____ *(seal)*

Contractor's Name and Corporate Seal

_____ *(seal)*

Surety's Name and Corporate Seal

By: _____

Signature

By: _____

Signature *(attach power of attorney)*

Print Name

Print Name

Title

Title

Attest: _____

Signature

Attest: _____

Signature

Title

Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond shall arise after the following:
 - 5.1 Claimants who do not have a direct contract with the Contractor,
 - 5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
 - 5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).
 - 5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
 - 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
 - 7.2 Pay or arrange for payment of any undisputed amounts.
 - 7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.
8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

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11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. Definitions

- 16.1 **Claim:** A written statement by the Claimant including at a minimum:
1. The name of the Claimant;
 2. The name of the person for whom the labor was done, or materials or equipment furnished;
 3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
 4. A brief description of the labor, materials, or equipment furnished;
 5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;

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6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
 7. The total amount of previous payments received by the Claimant; and
 8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
- 16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
- 16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
- 16.4 **Owner Default:** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
- 16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.
17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.
18. Modifications to this Bond are as follows:

GENERAL REQUIREMENTS

SECTION 01 00 00

Sections of Division I, General Requirements, are specifications written to cover the administrative requirements and work related requirements of the Contract. This Division is intended to supplement the requirements of the Contract Specifications, in any instance where Division one contradicts or does not agree with the Contract Specifications, the Contract shall take precedence. The basic titles and section numbers are as follows:

<u>TITLE</u>	<u>SECTION NO.</u>
Summary of Work.....	.010100
Allowances.....	.010200
Measurements and Payments .....	.010250
Alternates .....	.010300
Coordination .....	.010400
Regulatory Requirements .....	.010600
References .....	.010900
Special Project Procedures .....	.011000
Demolition/Removal Project Procedures .....	.011100
Project Meetings.....	.012000
Submittals.....	.013000
Mobilization .....	.013100
Survey and Layout Data.....	.013300
Quality Control .....	.014000
Construction Facilities and Temporary Controls .....	.015000
Soil Erosion and Sedimentation Control .....	.015650
Material and Equipment .....	.016000
Storage and Protection .....	.016200
Facility Start Up .....	.016500
Contract Close Out.....	.017000
Project Record Documents .....	.017200
Warranties and Bonds .....	.017400

SUMMARY OF WORK

SECTION 010100

I. I. GENERAL

- A. General information covering the "Scope of Work" is specified on the Invitation to Bid Form. Additional information is as follows:

The **work** for the Construction Project at Tierney Park, Lexington, Michigan, includes but is not necessarily limited to demolition of existing pavement, installation of Sanitary Sewer collection system, installation of a water distribution system, installation of a storm water collection system, installation of conduits communications, installation of electric system, placement of asphalt pavement with curb and gutter, placement of sidewalks, installation of a landscape lighting system, installation of landscaping and related site work as indicated in the project manual and on the project drawings and includes providing and paying for all labor, materials, equipment, tools, construction equipment all machinery, water, heat, utilities, transportation equipment and costs, business and pedestrian traffic control and other facilities and services necessary for the proper execution and completion of the **work**, whether temporary or permanent, and whether or not incorporated or to be incorporated in the **work**.

ALLOWANCES

SECTION 010200

I. I. GENERAL

- A. Inspection and Testing Allowances:

1. Bidders must include in their Base Proposal all costs for testing certifications as required to be done by the **Contractor** as specified in Section 013300 and 014000 and for project stakeout.

MEASUREMENT AND PAYMENT

SECTION 010250

I. I. GENERAL

- A. Schedule of Values: Before subdivision of first application for payment, the **Contractor** must submit a schedule of values, approved by the **Professional**, of the various tasks that must be performed to complete all the **work**. The schedule must show each task and the corresponding value of the task, including separate monies allocated for withholding. The aggregate total value for all tasks must be equal to the total contract sum.

ALTERNATES

SECTION 010300

I. I. GENERAL

- A. The Contract will be awarded on the basis of the Base Proposal Sum stated on the Proposal and Contract, and any alternates selected by the Owner.

COORDINATION

SECTION 010400

I. I. GENERAL**A. Project Coordination:**

1. Prior to beginning **work** the **Contractor** must meet with the **Owner** and arrange the schedule for the project. Once the project is started, it must be carried out to completion without delay.
2. Phasing of **work** must be clearly established and verified with the **Engineer** prior to commencing **work** in any area. No **work** will begin until it is authorized by the Owner.
3. Any facility utility service interruptions or outages, including security, required by the **Contractor** in performing the **work** must be prearranged with the **Owner** and must occur only during those scheduled times.

B. Coordination:

1. If a scheduling conflict occurs between the **Contractors** and other work authorized by the **Owner**, the parties must provide 48 hours advance written conflict notification to the **Professional** who must coordinate and provide resolutions and re-scheduling without affecting the contract.
2. Coordination, mutual scheduling and excellent working relationships with all parties is necessary and specific for this project.
3. The **Contractor** must do all cutting, fitting or patching of the **work** that may be required to make its parts fit together properly or make new **work** join with the existing site features. The **Contractor** must take proper precautions so as not to endanger any existing **work**.
4. Power for boats and electric ice eaters (bubblers) must be maintained at all times either thru existing electric system or the proposed system
5. Boats and floating docks must be accessible at all times throughout the project

REGULATORY REQUIREMENTS

SECTION 010600

I. I. GENERAL**A. Regulations:**

1. **LAWS:** The **Contractor** and its **Subcontractors/Suppliers** must comply with all Federal, State and local Laws applicable to the **work** and site.
2. **Codes:** All **works** must be provided in accordance with the State Construction Code Act, 1972 PA 230, as amended, MCL 125.1501 et seq., and all applicable Michigan construction codes and fire safety including but not limited to: Michigan Building Code, Michigan Residential Code, Michigan Uniform Energy Code, Michigan Electrical Code, Michigan Rehabilitation for Existing Buildings, Michigan Mechanical Code, Michigan Elevator Code, National Fire Protection Association and Michigan Plumbing Code. If the **Contractor** observes that any Contract Document conflicts with any Laws or the State Construction Code or any permits in any respect, the **Contractor** must promptly notify the **Professional** in writing. If the **Contractor** provides any **work** knowing or having to reason to know of such conflict, the **Contractor** must be responsible for that performance.
3. **Permits:** All required construction permits must be secured and their fees including inspection costs must be paid by the **Contractor**. The time incurred by the **Contractor** in obtaining construction permits must constitute time required to complete the **work** and does not justify any increased to the Contract time or Price, except when revisions to the drawings and/or Specifications required by the permitting authority cause the Delays. The **Contractor** must pay all charges of Public Utilities for connections to the **work**, unless otherwise provided by Cash Allowances specific to those connections.
4. **Taxes:** The **Contractor** must pay all Michigan sales and use taxes and any other similar taxes covering the **work** that are currently imposed by legislative enactment and as administered by the Michigan Department of Treasury, Revenue Division. If the **Contractor** is not required to pay or bear the burden or obtains a refund of any taxes deemed to have been included in the Bid and Contract Price, the Contract Price must be reduced by a like amount and that amount, whether as a refund or otherwise, must ensure solely to the benefit of the Owner.
5. **Safety and Protection:** The **Contractor** and its Subcontractors/Suppliers must comply with all applicable Federal, State and Local laws governing the safety and protection of persons or property, including, but not limited to the Michigan Occupational Safety and Health act (MIOSHA), 1974 PA 154, as amended, MCL 408.1001 et seq., and all rules promulgated under the Act. The **contractor** is responsible for all damages, injury or loss to the **work**, materials, equipment, fines, and penalties as a result of any violation of such Laws, except when it's due to the fault of the Drawings or Specifications or to the Act, error or omission of the **Owner** or **Professional**. The **Contractor** is solely responsible for initiating, maintaining and supervising all safety precautions and programs and such responsibility must continue until such time as the **Professional** is satisfied that the **work**, or **work** inspected, is completed and ready for final payment. In doing the **work** and/or in the event of using explosives, the **Contractor** must take all necessary safeguards and provide the necessary protection to prevent damage, injury or loss to: (a) all employees on the **work** and other persons who may be affected by the **work**, (b) all the **work** and materials and equipment to be incorporated into the **work**, whether stored on or off the site, and (c) other property at or adjacent to the site, including trees, shrubs, lawns, walks, pavements, roadways, piers, structures, utilities, and Underground Utilities not designated for removal, relocation or replacement. In the event of severe weather, the **Contractor**

must inspect the work and the site and take all reasonably necessary actions and precautions to protect the **work** and ensure that public access and safety are maintained.

6. **Michigan Right to Know Law:** The **Contractor** and its Subcontractors/Supplies must comply with MIOSHA, Michigan Right-to-Know Law, Public Act 80 of 1986 (ACT) and the rules promulgated under it. The act places certain requirements of employers to develop a communication program designed to safeguard the handling of hazardous chemicals through labeling of chemical containers and development and availability of Material Safety Data Sheets (MSDS), and to provide training for employees who **work** with these chemicals and develop a written hazard communications program. The Act also provides for specific employee rights, including the right to be notified of the location of MSDS and to be notified at the site of new revised MSDS within five Business Days after receipt and to request MSDS copies from their employers. The **Contractor**, employer or Subcontractor must post and update these notices at the site.
7. **Environmental Requirements:** The **Contractor** and its subcontractors/suppliers must comply with all applicable Federal, State and Local environmental Laws, standards, orders or requirements including but not limited to the National Environmental Policy Act of 1969, as amended, Michigan Natural Resources and Environmental protection Act. P.A. 4561 or 1994, and amended, the Clean Air Act, as amended, Pollution Prevention Act, as amended, Resource Conservation and Recovery Act, as amended, National Historic Preservation Act, as amended and Energy Policy and Conservation Act.
8. **Nondiscrimination:** For all contracts in amount of \$5,000.00 or more, or for Contracts entered into with parties employing three or more employees; in connection with the performance of **work** under this Contract, the **Contractor** and its Subcontractors and Supplies must comply with the following requirements:
 - a. Not to discriminate against any employee or applicant for employment because of race, color, religion, national origin, age, sex, height, weight or marital status and take affirmative action to ensure that applicants are employed, and the employees are not subject to such discrimination. Such action must include, but is not to be limited to, the following: employment, upgrading, demotion or transfer; recruitment advertising; layoff termination; rates of pay or other forms of compensation; and selection for training.

REFERENCES

SECTION 010900

I.I. GENERAL

- A. References will be made in an abbreviated alpha numeric form to specific standard specifications, reference publication and building codes of federal or State agencies, manufacturers, associations or trade organizations. Such references will be identified by the alphabetic affrication which identifies the government agency, the association or organization followed by the rule, section or detail number that are to form a part of these specifications, the same as if fully set forth herein, and must be of latest issued date in effect three months prior to the bid opening date shown on the Proposal and Contract. The abbreviations used are as follows:

<u>Abbreviation</u>	<u>Agency, Association or Organization</u>
ACI	American Concrete Institute
AISC	American Institute of Steel Construction, Inc.
ANSI	American National Standards Institute, Inc.
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society of Testing & Materials
AWS	American Welding Society
AWWA	American Water Works Association
BOCA	Building Officials & Code
CDA	Copper Development Assn., Inc.
CISPI	Cast Iron Soil Pipe Institute
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard
EGLE	Michigan Department of Environment, Great Lakes and Energy
F/M	Factory Mutual Research Corporation
FS	Federal Specifications
HEW	United States Department of Health Education & Welfare
MDOT	Michigan Department of Transportation
NEC	National Electric Code
NFPA	National Fire Protection Agency
NSF	National Sanitation Foundation Testing laboratory, Inc.
NSWMA	National Solid Waste Management Association
PCA	Portland Cement Association
UL	Underwriters Laboratories, Inc.
USACOE	United States Army Corp of Engineers
USBM	United States Bureau of Mines
USDC	United States Department of Commerce

SPECIAL PROJECT PROCEDURES

SECTION 011000

I.1. GENERAL

- A. It is the intent, that for the duration of the project, the contractor will be responsible for all construction barricades and enclosures, traffic control, construction signage, job site security measures, and relevant site restoration work. In the event that unforeseen, excessive or beyond typical damage is caused by the contractor, the professional reserves the right to apportion incurred costs for associated work at their own discretion and at no cost to the Owner. This includes needed extension times for barricades, traffic control, security measures, etc. due to extended delays by the Contractor.
- B. The **Contractor** must post appropriate construction signs to advise the occupants and visitors of occupied facilities of the limits of construction **work** areas, hardhat areas, excavations, construction parking and staging areas, etc. The **Contractor** must maintain safe and adequate pedestrian and vehicular access to fire hydrants, commercial and industrial establishments,

churches, schools, parking lots, floating docks, hospitals, fire and police station and like establishments. The **Contractor** must obtain written approval from the **Owner** ten Calendar Days before connecting to existing facilities or interrupting the services on site.

C. Barriers and Enclosures:

1. The **Contractor** must furnish, install and maintain as long as necessary and remove when no longer required adequate barriers, warning signs or lights at all dangerous points throughout the **work** for protection of property, workers and the public. The **Contractor** must hold the Village of Lexington harmless from damage or claims arising out of any injury or damage that may be sustained by any person or persons as a result of the **work** under the Contract.

D. Traffic Control and Barricades:

1. If needed, traffic control work shall be in accordance with the requirements of Section 812 of the 2020 MDOT Standard Specifications for Construction and as herein specified. The Contractor is advised that the current Michigan Manual of Uniform Traffic Control Devices (MMUTCD) is hereby established as governing all work in connection with traffic control devices, barricade lighting, etc., required on this project. Necessary emergency work performed by the local municipality or any other emergency service due to non-compliance of the approved traffic control plan will be billed against the Contractor
2. The Contractor shall always maintain local traffic on all local streets. Walks, driveways, and entrances to buildings shall not be unnecessarily blocked. Vehicular access shall be maintained to all State, public and commercial properties as designated by the Professional at all times. Construction shall be completed in such a manner as to always maintain the required entrance width for traffic.
3. Existing street name signs, stop signs and other existing traffic signs removed by the Contractor due to construction activity shall be reset temporarily by the Contractor where required. Salvaged signs to be incorporated into the new construction will be reinstalled by the Contractor as soon as final grading and work is completed in the section involved.

E. Construction Aids:

1. The **Contractor** must furnish, install, and maintain as long as necessary and remove when no longer required, safe and adequate scaffolding, ladders, staging, platforms, railings, hoisting equipment, etc., as required for proper execution of the work. All construction aids must conform to Federal, State, and local codes or Laws for protection of workers and the public.
2. Pumping and Drainage: The **Contractor** must provide all pumping necessary to keep excavations and trenches free from water the entire period of **work** on the Contract. The **Contractor** must construct and maintain any necessary surface drainage systems on the **work** site so as to prevent water entering existing structures or to flow onto public or private property adjacent to the Agency's land, except for existing drainage courses or

into existing drainage systems. The **Contractor** must prevent erosion of soils and blockage of any existing drainage system.

DEMOLITION/REMOVAL PROCEDURES

SECTION 011100

a. GENERAL

- A. Furnish all equipment, materials, labor, services and transportation necessary to complete all demolition, removal and legal disposal required in connection with the existing Pier system sections to be removed as indicated on construction drawings.
- B. Locations: Notations are made in various locations on the drawings to call attention to demolition and removal which is required; however, these drawings are not intended to show each and every item to be removed. The **Contractor** and the Subcontractors for the various trades shall remove the materials related to their respective trades as required to permit the construction of the new **work** as shown.
- C. Preparation: Protect all existing **work** that is to remain and restore in an approved manner any such **work** that becomes damaged.
1. Rubbish and debris resulting from the **work** shall be removed immediately from the site and legally disposed of by the **Contractor**.
 2. Any items that are attached or connected to the existing pier sections to be removed and are deemed salvageable by the **Owner** or are to be reused, should be removed prior to demolition. The **Contractor** should coordinate with the **Owner** prior to demolition to identify items that shall be salvaged. All salvaged material should be stockpiled on site at the location chosen by the **Owner**. Any items being reused shall be stockpiled safely away from all construction activity and protected from any damage that may harm these items or deem them unusable.
- D. Coordination: Demolition **work**, in connection with any new unit of **work**, shall not be commenced until all new materials required for completion of that new item of **work** are at hand.

PROJECT MEETINGS

SECTION 012000

I.1. GENERAL

- A. **Pre-Construction Conferences:** The **Professional** will schedule a pre-construction conference to be attended by the **Professional**, **Owner**, and the **Contractors**. A project procedure will be established for the **work** during the pre-construction meeting. When no organizational meeting is called, the **Contractor**, before beginning any **work**, must meet with the **Professional** and arrange a **work** schedule for the Project. Once the Project has been started, the **Contractor** must carry it to completion without delay.

- B. Progress Meetings: The **Professional** will schedule a progress meeting to be held on the job site whenever needed to supply information necessary to prevent job interruptions, to observe the **work** or to inspect completed **work**. The **Contractor** must be represented at each progress meeting by persons with full authority to act for the **Contractor** in regard to all portions of the **work**.

SUBMITTALS

SECTION 013000

I.1. GENERAL

- A. **Shop Drawings, Samples and Technical Data:** Within 20 days of notice of award of contract and prior to the delivery of any material or equipment to the job site, the **Contractor** must submit to the **Professional**, a complete list of material suppliers, Subcontractors, and brand names of all materials required by the Contract Documents. Each submittal must be stamped/certified to indicate that the **Contractor** has satisfied the requirement of the Contract Documents, and all trade construction Submittals must be coordinated, reviewed and stamped/approved by the **Contractor** before submission to the **Professional**. Before each submission, the **Contractor** must (a) determine and verify all field measurements, quantities, dimensions, instructions for installation and handling of equipment and systems, installation requirements (including location, dimensions, access, fit, completeness, etc.), materials, color, catalog numbers, and other similar data as to correctness and completeness, and (b) have reviewed and coordinated that technical Submittal with other technical submittals and the requirements of the Contract Documents. The **Contractor** must give the **Professional** specific written notice of any variation from the requirements of the Contract Documents. Neither the **Owner's** authority to review any of the Submittals by the **Contractor**, nor the **Owner's** decision to raise or not to raise any objections about the Submittals, creates or poses any duty or responsibility on the **Owner** to exercise any such authority or decision for the benefit of the **Contractor/Subcontractor/Supplier**, any surety to any of them or any other third party. The **Contractor** is not relieved of responsibility for errors or omissions in shop drawings, product data, samples, or similar submittals just because the **Professional** approved them. The finalized As-Built/Record Documents and approved Submittals must be required for processing final payment to the **Contractor**. Thereafter, the **Contractor** must submit to the **Professional** with such promptness as to cause no delay in the **work**, a minimum of five copies of shop drawings, product data catalogs, material schedules, safety data sheets, etc. Following examination by the **Professional**, three copies will be retained, and the remaining copies will be returned to the **Contractor** with indication of approval or with notations for correction. The following materials, building systems and equipment require the submission of shop drawings, material lists, products data catalogs, etc. submission of information on other material or equipment may be requested by the **Professional** at any time. All required submittals include but are not limited to the list below. It is the contractor's responsibility to fully review contract documents and understand the submittal requirements for the projects and it's components. Furnish total number of submittals so **Contractor** receives the number back he requires plus 3 to be kept by the **Professional**.

<u>ITEMS OF WORK</u>	<u>TYPE OF INFORMATION</u>	<u>SECTION NO.</u>
<u>DIVISION I – GENERAL REQUIREMENTS</u>		
Measurement and Payment	Schedule of Values	010250

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Record Documents	Site Layout Dwgs. and Info.	013300
Quality Control	Submittal Register, Q.C.	014000
	Inspection Program for All Work, Construction Schedule	
Operations and Maint. Data	Hard Copy Manuals	019200

DIVISION 2 – SITE WORK

Site Conditions	Plan and Schedule	020100
Site Access and Restoration	Plan and Schedule	020110
Tree Protection	Plan and Schedule	020120
Soil Prep Fine Grading	Plan and Schedule	023100
Site Demolition and Removals	Plan and Schedule	024100
Excavating, Backfilling & Compaction	Plan and Schedule	025100
Cast in Place Concrete	Details and Matl. Info As-Needed	033000
Exposed Aggregate Paving	Details and Matl. Info As-Needed	033010
Integral Colored Concrete	Details and Matl. Info As-Needed	033020
Steel Railing	Details and Matl. Info As-Needed	055200
Timber Carpentry	Details and Matl. Info As-Needed	069000
Exterior Timber Stairway and Deck Assemblies	Details and Matl. Info As-Needed	069100
Site Furnishings	Details and Matl. Info As-Needed	129300
Topsoil	Details and Matl. Info As-Needed	310000
Machine Grading Modified	Details and Matl. Info As-Needed	312213
SESC Plan	Plan and Schedule	312500
Aggregate Base	Details and Matl. Info As-Needed	321123
Bituminous Pavement	Details and Matl. Info As-Needed	321216
Crushed Stone Paving	Details and Matl. Info As-Needed	321413
Irrigation System	Details and Matl. Info As-Needed	328400
Seed Fertilizer & Mulch	Details and Matl. Info As-Needed	329200
Slope Restoration	Details and Matl. Info As-Needed	329210
Shoreline Seed	Details and Matl. Info As-Needed	329220
Plant Materials	Details and Matl. Info As-Needed	329300
Planting Trees Shrubs	Details and Matl. Info As-Needed	329310
Rain Garden and Bioswale	Details and Matl. Info As-Needed	329312
Reinforced Turf Rings	Details and Matl. Info As-Needed	329320
Upland Utilities	Details and Matl. Info As-Needed	330000
Utility Conduit	Details and Matl. Info As-Needed	330010
Light Foundation	Details and Matl. Info As-Needed	330040
Water Service	Details and Matl. Info As-Needed	331210
Sanitary Sewer	Details and Matl. Info As-Needed	331300
Sanitary Sewer Leads and Cleanouts	Details and Matl. Info As-Needed	331310
Sanitary Manhole	Details and Matl. Info As-Needed	331320
Site Electrical	Details and Matl. Info As-Needed	331500
Marine Fuel System Demolition	Details and Matl. Info As-Needed	332000
Marine Fuel System	Details and Matl. Info As-Needed	332010

- B. Submit the following information printed on each and every sheet of shop drawings and on the cover page of each and every specification, catalog or pamphlet.

- Name and location of the Project
- Drawing No.
- Date of Drawing
- **Contractor's** signature and approval stamp indicating that the information is accurate and complete and conforms to the intent of the drawings and specifications.
- A 3-inch wide by 3-inch high clear space for the **Professional** submittal approval stamp.

MOBILIZATION

SECTION 013100

PART 1 – GENERAL

1.1 SUMMARY

- A. The section describes work to be done with regard to mobilization for the **Contractor**.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. The contractor shall refer to MDOT standard Specifications for Construction 2020 Section 150.

PART 3 - EXECUTION

3.1 GENERAL

Bidders shall examine the site and make their own estimates of the work specified herein. **Contractor** is responsible for coordination among subcontractors.

PART 4 – METHOD OF MEASUREMENT

- A. The MOBILIZATION and other general requirements shall be measured on a LUMP SUM basis for payment.

PART 5 – BASIS OF PAYMENT

- A. The LUMP SUM price for the MOBILIZATION and other general requirements found in this specification shall include all materials, equipment, design, and supervision for mobilization as described herein and any incidentals necessary for completion of the work specified herein and as shown on the Contract drawings or as directed by the Owner.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
013100.01	Mobilization, Max 4%	Lump Sum
013100.02	General Conditions	Lump Sum

SURVEY AND LAYOUT DATA

SECTION 013300

I.1 GENERAL

- A. This work to be done under this section includes labor, materials, equipment, and services necessary to provide survey and layout data for the project.
- A. The **Contractor** is responsible for establishing and maintaining all lines and levels required for laying out and construction the **work**. The **Contractor** agrees to assume all responsibility due to inaccuracy of any **work** of the surveyor, and including incorrect benchmarks, their loss or disturbance. The **Contractor** shall notify the project **Professional** when staking so that the project **Professional** may review stakeout prior to construction **work** being done. Upon completion of the Project the Contractor must submit two copies of site layout drawings prepared for the Project and certified by the surveyor.
- B. Any discrepancies between proposed plan location control points and actual locations of built elements shall be identified and brought to the attention of the **Professional** prior to placement or construction of said elements. In instances of discrepancies, layout dimensions on plans shall govern placement of project elements.

QUALITY CONTROL

SECTION 014000

I.1.1 GENERAL

- A. **Testing Laboratory Services:** The following general classifications of work require submission of test reports and/or Certificates of Inspection. Additional submissions may be requested by the **Professional** at any time.

<u>ITEM OF WORK</u>	<u>TYPE OF INFORMATION</u>	<u>SECTION NUMBER</u>
Stone	Gradation	353150
Potable Water Service	Pressure	330110
Fire Prot. System	Pressure Testing	355000
Electrical	As Code Requires	356525, 330020
System Operation Demonstrations	Observe and Sign-In	016500

- B. Paving Materials: Before placement of any pavement, the **Contractor** must submit to the **Professional's** approval complete data on proposed mixes.
- C. Typical Note: Contractor must prepare and submit for approval and usage.
- Submittal Register Listing all Submittals Required
 - Quality Control Inspection Program for all **work** Items

- Construction Schedule

These must be submitted and approved well in advance of the start of construction. See drawings, project documentation and specification manual.

CONSTRUCTION FACILITIES AND TEMP. CONTROLS

SECTION 015000

I.1. GENERAL

- A. The **Contractor** must furnish and install all temporary facilities, utilities and controls required by the **work**, must remove them from State property upon completion of the **work**, and the grounds and existing facilities must be restored to their original condition.
- B. If water and electricity is available in the area where **work** will be performed, the **Contractor** will not be charged for reasonable use of these services for construction operation. The **Contractor** must pay costs for installation and removal of any temporary connections including necessary safety devices and controls. Use of services must not disrupt or interfere with operations of the Owner.
- C. Temporary Sanitary Facilities:
1. Portable Toilets: The **Contractor** must provide and maintain portable temporary toilets in locations approved by the Owner. There must be sufficient number of the **work** force and they must comply with all federal, State and local code requirements. The **Contractor** must maintain the temporary toilets in a sanitary condition at all times and must remove them when the **work** under this contract is complete. The **Contractor's** employees are not allowed to use any existing Owner toilet facility without prior permission.
 2. Public Toilets: If available, the Owner will designate a permanent toilet facility on the premises for use by personnel employed in the **work**. The **Contractor** must repair any damage to the toilet facility caused by their employees and maintain it in a clean and sanitary condition.
- D. Field Office:
1. **On Site Trailer:** At the beginning of the **work**, the **Contractor** may provide a field office with temporary storage building at the site in a location acceptable to the **Owner**. The building may be a trailer. The **Contractor** must provide such other temporary buildings as he may require for the use of workers and safe storage for tools and materials. Job signs with **Contractor's** name, logos, specialty, etc., are not allowed.
 2. Coordinate placement locations with **Owner**.

SOIL EROSION AND SEDIMENTATION CONTROL

SECTION 015650

I.1. GENERAL

- A. All **work** under this Contract must meet the storm water management requirements of the Project and comply with the applicable Soil Erosion and Sedimentation Control (SESC) rules and regulations. **Contractor** is responsible for obtaining and complying with Leelanau County SESC Permit. **The Professional** has the right to assess a fine to the **Contractor** for noncompliance with the provisions of the Contract Documents and/or SESC regulations applicable to this **work** and fines must be in addition to any other remediation cost or liquidated damages applicable to the Project and may exceed the value of the Contract. **Also refer to specific project Soil Erosion plans, details and specifications – Section 02215 - SOIL EROSION AND SEDIMENTATION CONTROL.**
- B. All **work** under this contract must meet all requirements and conditions as stated in the permits from EGLE.

MATERIALS AND EQUIPMENT

SECTION 016000

I.1. GENERAL

- A. The **Contractor** must furnish and be reasonable for all materials, equipment, facilities, tools, supplies and utilities necessary for completing the **work**. All materials and equipment must be provided as described in the Contract Documents and of good quality, free of defect and new and must be applied, installed, connected, erected, used, cleaned and conditioned following the Manufacturer's and Supplier' instructions.

Delivery, storage, and Handling: All materials and equipment delivered to and used in the **work** must be suitably stored and protected from elements that will cause material damage or an undesirable product. The areas used for storage must only be those approved by the **Owner**. The **Owner** assumes no responsibility for stored material. The ownership and title to materials will not be vested in the **Owner** before materials are incorporated in the **work**, unless payment is made by the **Owner** for stored materials and equipment as specified in Section 008100. After delivery, before and after installation, the **Contractor** must protect materials and equipment against theft, injury or damage from all causes.

1. Bulk materials which are subject to deterioration because of dampness, the weather or contamination must be covered and protected while in storage. Materials in containers must be kept in original sealed containers, unopened, with labels plainly indicating manufacturer's name, brand, type and grade of material. Containers that are broken, opened, watermarked and/or contain caked, lumpy or otherwise damaged materials are unacceptable and must be immediately removed from the **work** site.
2. Equipment susceptible to water damage and stored outdoors must be kept form contact with the ground, away from areas subject to flooding and covered with weatherproof plastic sheeting or tarpaulins.
3. The **Contractor** must certify that any martials stored off-site are:

- a. Store on property owned or leased by the **Contractor** or owned by the Owner.
- b. Insured against loss by fire, theft, flood or other hazards.
- c. Properly stored and protected against loss or damage.
- d. In compliance with the plans and specifications.
- e. Specifically allotted, identified and reserved for the project.
- f. Itemized for tracking and payment.
- g. Subject to these conditions until the items are delivered to the project site.

STORAGE AND PROTECTION**SECTION 016200****I. I. GENERAL**

- A. Except as otherwise approved by the **Professional**, determine and comply with manufacturer's recommendations on product handling, storage, and protection.
- B. Packaging:
 1. Deliver products to the job site in their manufacture's original container, with labels intact and legible.
 2. Maintain packaged materials with seals unbroken and labels intact until time of use.
 3. Promptly remove damaged material and unsuitable items form job site, and promptly replace with material meeting the specified requirements, at no additional cost to the **Owner**.
 4. The **Professional** may reject as non-complying such material and products that do not bear identification satisfactory to the **Professional** as to manufacturer, grade, quality, and other pertinent information.
- C. Protection:
 1. Provide protection for finished surfaces in vehicle or foot traffic areas prior to allowing equipment or materials to be moved over such surfaces.
 2. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the **Owner**.

FACILITY START UP**SECTION 016500**

I.1. GENERAL

- A. **Tests:** The complete installation consisting of the several parts of equipment and systems installed according to the requirements of the Contract Documents must be ready in all respects for use by the State Agency and must be subjected to a test at full operating conditions and pressures for normal conditions of use.
- B. **Adjustments:** Contractor must adjust and replace the **work** which is necessary to fulfill the requirements of the Contract Documents and to comply with the directions and recommendations of the manufacturer of the several parts of equipment, and to comply with all provisions of **Professional's** drawings/specifications and all codes and regulations which may apply to the entire installation.
- C. **Demonstrate: Contractor** must provide an on-site demonstration and training of all systems operations to the **Owner** when it is substantially completed.

CONTRACT CLOSE OUT

SECTION 017000

I.1. GENERAL

A. Substantial Completion:

The **Contractor** must notify the **Professional**, when the **work** will be substantially complete and ready for inspection and preparation of a list of minor replacement, correction and adjustment items. The **Contractor** must be represented on the job site at the time this inspection is made and thereafter must complete all **work** by the date set for final acceptance by the **Owner**.

B. Cleaning:

1. Regular Cleaning: The **Contractor** must remove all scrap or removed material, debris or rubbish from the project **work** site at the end of each working day and more frequently whenever the **Owner** and/or Field Representative deems such material to be a hazard. The **Contractor** cannot discard materials on the grounds of the **Owner** without the express permission. No salvage or surplus material may be sold on the premises of the **Owner**. No burning of debris or rubbish is allowed. Any recycled materials must be recycled, and the **Contractor** will be required to provide recycling plan.
2. Final Cleaning: Just before final acceptance by the **Owner**, the **Contractor** must clean all of the **work** and existing surfaces, dock elements and contents that were dirtied by their operations and make repairs for any damage or blemish that was caused by the **work**.

PROJECT RECORD DOCUMENTS

SECTION 017200

I.1. GENERAL

- A. The **Contractor** must furnish to the Village of Lexington, along with their request for final payment, reproducible drawings of plans, and any section or details necessary, clearly showing the actual path and location of materials, utilities and equipment installed in the project. Plans must be drawn at a scale of 1"=20' or larger. Keep drawings and dimensions as project progresses, available at all times.

WARRANTIES AND BONDS

SECTION 017400

I.1. GENERAL

- A. The **Contractor** must obtain and forward to the **Owner** any special warranties or requirements of the contract documents. All required material must accompany **Contractor's** request for final payment, including all operation and maintenance data required by the contract documents.

END OF DIVISION I – GENERAL REQUIREMENTS

END OF SECTION

TRAFFIC CONTROL

SECTION 01 55 26

PART I - GENERALI.01 SUMMARY

- A. Section covers requirements for traffic control during construction of the project.

I.02 REFERENCES

- A. AASHTO Guide for the Design of Bicycle Facilities, Current Edition.
- B. AASHTO Roadside Design Guide, Current Edition.
- C. American Traffic Safety Services Association (ATSSA).
- D. Michigan Department of Transportation (MDOT), Standard Specifications for Road and Bridge Construction, Current Edition.
- E. Federal Highway Administration. Standard Highway Signs.
- F. U.S. Department of Transportation, Federal Highway Administration (USDOT): Manual of Uniform Traffic Control Devices (MUTCD).
- G. U.S. Department of Transportation, Federal Highway Administration: Design Guidance: Accommodating Bicycle and Pedestrian Travel: A Recommended Approach.

I.03 SUBMITTALS

- A. Traffic Control Plan developed by CONTRACTOR in accordance with guidance provided by CONTRACT DOCUMENTS.
 - a. Submit the initial phase Traffic Control Plan at the preconstruction conference. Submit plans for future phases of construction a minimum of 28 days before start of that construction phase to allow review and resubmittal, if necessary, and public notification. Meet with the OWNER and other affected agencies having jurisdiction to review the Traffic Control Plans for each phase of construction. Do not begin construction on any given phase before receiving written acceptance.
 - b. Failure to submit the Traffic Control Plans within the specified time frames will not be justification for additional working days. Failure to adequately address comments in any required resubmittal also will not justify additional working days.
- B. Administrative Submittals: Copies of permits, licenses, and approvals for construction as required by Laws and Regulations and governing agencies.
 - a. CONTRACTOR shall be responsible for preparing submittals to MDOT to secure any necessary permits or approvals related to Traffic Control activities. Application for permits and governing agency approvals shall only be made after acceptance of plan by OWNER. OWNER will submit prepared traffic control plans to MDOT Construction Permit System.
- C. Parking area plans.
- D. Product Data: Warning signs and barricades.
- E. If required due to construction activities, closure of existing sidewalk sections will require pedestrian detour plans to be submitted.

I.04 VEHICULAR TRAFFIC

- A. Traffic Control Plan:
 - a. If a Traffic Control Plan is provided in the drawings and specifications it shall be used by CONTRACTOR as guideline only. The CONTRACTOR shall be responsible for the development and implementation of the Traffic Control Plan.
 - b. CONTRACTOR shall submit a Traffic Control Plan for approval by OWNER in accordance with the submittal requirements defined in these specifications. Adjustments to the approved plan may be required by OWNER based on actual traffic operations. Changes to the plan shall only be made with written approval of the OWNER.

PART 2 - PRODUCTS

2.01 SAFETY DEVICES AND SYSTEMS

- A. CONTRACTOR shall use devices and systems which meet crash test requirements as defined by the Federal Highway Administration unless exceptions are granted by the OWNER.

2.02 TRAFFIC CONTROL SIGNING AND DEVICES

- A. Signs: Comply with the requirements of the Traffic Control Plan, other requirements defined in this section and any applicable requirements defined in the reference documents, including MDOT Standard Specifications.
- B. Channelizing Devices:
 - a. Comply with the requirements of the Traffic Control Plan, other requirements defined in this section and any applicable requirements defined in the reference documents, including MDOT Standard Specifications.
 - b. Use construction orange tubular markers and cones during daylight hours only.
- C. Barricades:
 - a. Comply with the requirements of the Traffic Control Plan, other requirements defined in this section and any applicable requirements defined in the reference documents, including MDOT Standard Specifications.
 - b. Do not use rocks, asphalt, or concrete pieces, construction materials, and other debris as weighting devices for barricades. Sand bags will be permitted as long as low center of gravity is maintained as approved.
- D. Precast Concrete Barrier:
 - a. Comply with the requirements of the Traffic Control Plan, other requirements defined in this section and any applicable requirements defined in the reference documents, including MDOT Standard Specifications.
 - b. Use an approved construction zone attenuator or permanent style end sections, as listed in MDOT Guidelines for Attenuators and End Section.
 - i. Use a construction zone attenuator when approach ends of temporary precast barrier are within AASHTO clear zone.
 - ii. Use AASHTO Roadside Design Guide to determine proper clear zone distance requirements.

PART 3 - EXECUTION3.01 VEHICULAR TRAFFIC

- A. Conform to the USDOT MUTCD or applicable statutory requirements of authority having jurisdiction and the accepted Traffic Control Plan. Use typical MDOT detail M0730a for typical temporary traffic control for one-lane closure.
- B. Furnish, erect, maintain and upon completion of the work, remove all traffic control devices and barricade lights within the project and around the perimeter of the project for the safety and protection of through and local traffic which shall be maintained by the CONTRACTOR throughout the project. This includes, but is not limited to, advance, regulatory and warning signs, barricades and channeling devices at the intersecting streets and all other traffic control devices required to maintain traffic as called for on the plans or as required in the MMUTCD. Traffic regulators, where required by the ENGINEER, are included.
- C. Allow emergency vehicles immediate passage.
- D. Recognize that Local Government requirements take precedence over the MUTCD. Operations on or about traffic areas and provisions for regulating traffic shall additionally be subject to the regulation of other governmental agencies having jurisdiction over the affected areas.
- E. Keep traffic areas free of excavated material, construction equipment, pipe, and other materials and equipment.
- F. Always keep fire hydrants and water control valves free from obstruction and available for use.
- G. Conduct operations in a manner to avoid unnecessary interference with public and private roads and drives and provide and maintain temporary access for businesses and residences. Provide and maintain suitable and safe bridges, detours, or other temporary expedients for accommodation of public and private travel. When access to private driveways must be temporarily denied due to construction operations, notify the property owner or responsible party of such closure not less than 24 hours in advance of closure. Give notification in writing and include the estimated duration of the closure. When partial widths of new pavement are available to traffic, access to drives shall be provided immediately.
- H. Minimum lane width shall be 10 feet, unless noted otherwise. Where cones are used to separate traffic lane from construction zone, do not use traffic lane for accessing construction zone, and do not store materials or equipment on or near shoulder of traffic lane side of roadway.
- I. In making street crossings, do not block more than one-half the street at a time. Maintain one lane of traffic at all times. Ensure access for traffic in both directions.
- J. Notify the fire department, police/sheriff department, highway patrol, ambulance service, local school district, and transit 14 days before closing roadway or portion thereof. Notify said departments or agencies when streets are again passable for vehicles. Conduct operations with the least interference to fire equipment access, and at no time prevent such access. Furnish CONTRACTOR's night emergency telephone numbers to the police or sheriff's department.
- K. Pedestrian and bicycle access along sidewalks and streets will be kept open and safe from construction activities and traffic lanes.
- L. Existing street name signs stop signs and other existing traffic signs will be removed by the CONTRACTOR and reset temporarily by the CONTRACTOR where required. Salvaged

signs to be incorporated into the new construction will be reinstalled by the CONTRACTOR as soon as the final grading is completed in the section involved.

- M. Where the existing pavement or partial widths of new pavement are to be utilized for the maintenance of local or through traffic, Type II Barricades will be required at 50' intervals or as directed by the ENGINEER for channeling and directing traffic through the construction area.
- N. Flaggers: May be required to provide for public safety or the regulation of traffic, or by jurisdictional authorities; and if used, shall be properly equipped and certified by ATSSA.

3.02 PROTECTION OF WORK AND PROPERTY

- A. Provide Warning Signs and Barricades for the following:
 - a. Open trenches and other excavations.
 - b. Obstructions, such as material piles, equipment (moving or parked), and piled embankment.
 - c. Protection of roads and driveways.
- B. Warning signs and barricades shall be illuminated by means of warning lights from sunset to sunrise.

3.03 PARKING

- A. CONTRACTOR, with the approval of the OWNER, shall designate parking areas for the use of all construction workers and others performing work or furnishing services in connection with the project to avoid interference with public traffic, OWNER's operations, or construction activities.

3.04 ROADWAY USAGE BETWEEN OPERATIONS

- A. At all times when work is not actually in progress, CONTRACTOR shall make passable and shall open to traffic such portions of the project and temporary roadways or portions thereof as may be agreed upon between CONTRACTOR and OWNER and all authorities having jurisdiction over any properties involved.

PART 4 - METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. Traffic Control will be measured as noted below.

PART 5 - BASIS OF PAYMENT

5.01 TRAFFIC CONTROL

The basis of payment shall be as noted below for Lump Sum include all materials, labor, equipment, transportation, testing, and supervision necessary to complete the items identified herein, and any

incidentals necessary for completion of the work specified herein and as shown on the Contract drawings or as directed by the Engineer.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
015526.01	Traffic Control	Lump Sum

END OF SECTION

PART I - GENERAL**I.01 SUMMARY**

- A. To aid the continued instruction of operating and maintenance personnel, and to provide a positive source of information regarding products incorporated into the work, furnish, and deliver the data described in this section and in pertinent other sections of these Specifications
- B. Related work:
 - 1. Documents affecting work of this section include, but are not necessarily limited to, Sections in Division I of these Specifications.
 - 2. Required contents of submittals also may be amplified in pertinent other sections of these Specifications.

I.02 SUBMITTALS

- A. Comply with pertinent provisions of Division I – Section 013000.
- B. Submit one copy of a preliminary draft of the proposed manual or manuals to the Professional for review and comments.
- C. Unless otherwise directed in the pertinent other sections, or in writing by the Professional, submit two hard copies and one digital of the final manual to the Professional prior to indoctrination of operation and maintenance personnel and other Owner representatives.

I.03 QUALITY ASSURANCE

- A. In preparing data required by this section, use only personnel who are thoroughly trained and experienced in operation and maintenance of the described items, completely familiar with the requirements of this Section, and skilled in technical writing to the extent needed for communicating the essential data.

PART 2 - PRODUCTS**2.01 INSTRUCTION MANUALS**

- A. Where instruction manuals are required to be submitted under other sections of these Specifications, prepare in accordance with the provisions of this section.
- B. Format:
 - 1. Size: 8-1/2" x 11"

- 2. Paper: White bond, at least 20 lb. weight
 - 3. Text: Neatly written or printed
 - 4. Drawings: 11" in height preferable; bind in with text; foldout acceptable; larger drawings acceptable but fold to fit within the Manual and provide a drawing pocket inside rear cover or bind in with text.
 - 5. Flysheets: Separate each portion of the Manual with neatly prepared flysheets briefly describing contents of the ensuing portion; flysheets may be in color.
 - 6. Binding: Use heavy-duty plastic or fiberboard covers with binding mechanism concealed inside the Manual; 3-ring binders will be acceptable; all binding is subject to the Professional's approval.
 - 7. Measurements: Provide all measurements in U.S. standard units such as feet-and-inches, lbs, and cfm; where items may be expected to be measured within ten years in accordance with metric formulae, provide additional measurements in the "International System of Units" (SI).
- C. Provide front and back covers for each Manual, using durable material approved by the Professional, and clearly identified on or through the cover with at least the following information.

OPERATING AND MAINTENANCE INSTRUCTIONS

()

(_____ Name and address of Work _____)

(_____ Name of Contractor _____)

(_____ General subject of this Manual _____)

(_____ Space for signature of the _____)

(_____ Professional and approval date _____)

- D. Contents: Include at least the following:
- 1. Neatly typewritten index near the front of the manual, giving immediate information as to location within the manual of all emergency data regarding the installation.
 - 2. Complete instructions regarding operation and maintenance of all equipment involved, including lubrication, disassembly, re-assembly, fuel, mechanical including water, sanitary, electrical systems, start-ups, operations, and winter shutdown procedures.
 - 3. List of **subcontractor** and major suppliers, names, addresses and phone numbers.

OPERATION AND MAINTENANCE DATA

4. Complete nomenclature and part number of all replaceable parts, name and address of nearest vendor/supplier, and all other pertinent data regarding procurement procedure.
5. Copy of all guarantees and warranties issued. Provide a separate clearly stated list of warranties/guarantees that extend beyond the basic one-year overall warranty for equipment, materials, and systems specifically identified the stated list.
6. For all items and equipment installed as required per project submittal, copies of manufacturers' bulletins, catalog cuts, and descriptive data, where pertinent clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturers' data with which the installation is not concerned.
7. Written instructions for winter shut down and spring start up instructions for all systems written specifically for this project.
8. Copies of test results including bacteriological, pressure testing, gradation, compaction and concrete test results. Copies of building code agency final inspection approvals/Certificate of Occupancy, including building, mechanical, fuel, plumbing, electrical, and other required approvals.
9. Copies of all systems operational demonstration sign-in sheets.
10. Such other data as required in other pertinent sections of these Specifications.

PART 3 - EXECUTION

3.01 INSTRUCTION MANUALS

- A. Preliminary:
 1. Prepare a preliminary draft of each proposed manual.
 2. Show general arrangement, nature of contents in each portion, probably number of drawings and their size, and proposed method of binding and covering.
 3. Secure the Professional's approval prior to proceeding with final.
- B. Final: Complete the Manuals in strict accordance with the approved preliminary drafts and the Professional's review comments.
- C. Revisions:
 1. Following the indoctrination and instruction of operation and maintenance personnel, review all proposed revisions of the manual with the Professional.
 2. If the **contractor** is required by the Professional to revise previously approved manuals, compensation will be made as provided for under "Changes" in the General Conditions.

- D. Approved Manual: After final approval is given by the Professional, submit two (2) hard copy manuals and one (1) digital to the Professional who will forward to the Owner.

END OF SECTION

PART I - GENERAL**I.01 SUMMARY**

- A. Data and information furnished or referred to below is for the Contractor's information. The Owner will not be responsible for any interpretation of, or conclusion drawn from data or information.
- B. Indications of physical conditions on drawings and in the specifications are the result of site investigations by surveys, soundings, and record drawings. Physical conditions shown on the drawings are indicative of those that prevailed at the time of site investigations and may be different than those at the time of construction.
- C. All information known about site subsurface conditions is presented in the construction documents. Any subsurface obstructions found during construction should be dealt with by the Contractor with no additional cost to the Owner. Obstructions shall be dealt with in a manner, to as much as possible, prevent work stoppage and deviation from the anticipated project construction schedule. The Contractor shall raise any concerns they may have about the subsurface site conditions to the Professional before the start of construction.
- D. The Contractor shall report significant variations that would require changes to drawings or specifications to the Professional immediately.

I.02 TRANSPORTATION FACILITIES

- A. This locality is served by major highways and local roads. Investigate and obtain necessary information and data as to availability and use of access roads, dock facilities, and highways to project site.
- B. The Contractor must, without additional expense to the Owner, be responsible for obtaining any necessary permits to operate on or across public highways and Village streets in connection with the execution of the work.
- C. The site has active businesses. Employee and product delivery shall not be inhibited by construction activities.

I.03 LOCAL CONDITIONS

- A. The Contractor must investigate and satisfy himself as to any hazards likely to arise from weather conditions during performance of the work. Weather records and reports may be obtained from the nearest U.S. Weather Bureau Office.
- B. The Contractor must confine operations at the site as defined by the project drawings and these contract documents.

- C. The Contractor must schedule and segment work expeditiously for the public use of the site or portions of the site and pier available for public usage in a timely manner. Any project site shutdowns will be kept to a minimum and must be discussed in prior meetings with the Owner.
- D. Power for boats and electric ice eaters (bubblers) must be maintained at all times either thru existing electric system or the proposed system.
- E. Boats and floating docks must be accessible at all times throughout the project

I.04 COORDINATION

- F. Coordinate, cooperate, and schedule all work with all other Contractors, the Owner, and the Professional.

END OF SECTION

PART I - GENERAL**I.01 REFERENCES AND STANDARDS**

- A. The current edition of the General Provisions of Michigan Department of Transportation, Standard Specifications for Construction

I.02 DESCRIPTION

- A. Work includes all labor, supervision, equipment and services necessary for and reasonably incidental to the proper completion of the following items:
 - 1. Establish and maintain site access
 - 2. Finish grading of site after construction to restore pre-construction site topography and elevations, as needed.
 - 3. Restoration or replacement of any damaged items as determined necessary and directed by the project professional.
 - 4. Restoration of all damaged existing established turf with topsoil (minimum 6" depth), seed and erosion control including maintenance until accepted new turf establishment.
 - 5. Final restoration will account for any areas disturbed during the construction activities – including sidewalk demolition areas.

I.03 QUALITY ASSURANCE

- A. Contractor to observe and document, by video, photograph or other means, pre-construction site conditions including, but not limited to, approximate grades, curbs, signage, pavement, striping, utilities, turf, landscape plantings and trees. This documentation is especially important within the limits of construction as identified on plans or in any other areas potentially being used during construction.
- B. Contractor is responsible for ensuring public safety, and to utilize temporary fencing and barricades as necessary to prevent public interface with restoration operations. All barricades are to remain in place until restoration efforts are identified as complete by the project professional and should be removed thereafter.
- C. Contractor to utilize appropriate soil erosion and sediment control measures as necessary to stabilize restoration area. Contractor to furnish and install additional measures if deemed necessary by the Engineer.

I.04 SUBMITTALS

- A. Submit for approval: Site restoration plan
- B. The Contractor may submit alternate construction access plan for review by the project professional and respective agencies. If the access plan is found to cover all necessary and applicable requirements with respect to site access, the alternate plan may be approved.
- C. The Contractor shall submit drawings and material information for all items to be replaced or restored for approval prior to construction.
- D. Certification statement from seed mixture vendor stating botanical and common names, percentage by weight, and percentage of purity and germination for each type of grass seed provided in mixture.
- E. Certification statement from material manufacturers for fertilizers, soil amendments, herbicides and pesticides, and any other chemicals that may be required, including instructions for proper application method.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide all required personnel, equipment, materials, labor and erosion control measures, as needed, for the proper turf establishment of the restoration pre-construction conditions.
- B. Provide all required personnel, equipment, materials, labor and erosion control measures, as needed, for the proper replacement of any damaged site items. These items may include, but are not limited to, asphalt parking lot, striping, roadway, concrete curb, concrete sidewalk, utilities and any other damaged items as determined necessary and directed by the **Professional**. All restoration or replacement of damaged items must be constructed in accordance with the most recent MDOT standard practices and must match, as closely as possible in material and construction, the adjacent elements and pre-construction conditions. The project professional will have final say as to what items shall be removed and replaced as part of these restoration efforts. All standard testing of materials and construction shall comply and be followed, at the contractor's expense, and at the discretion of the project professional.
- C. Any topsoil material shall be in accordance with MDOT Standard Specification 917 – TURF AND LANDSCAPING MATERIALS
- D. Any seed used for restoration efforts shall be in accordance with MDOT Standard Specification 917 – TURF AND LANDSCAPING MATERIALS.

PART 3 - EXECUTION

3.01 GENERAL

- A. All site access efforts shall be done in accordance with contract drawings and specifications. It is the contractor's responsibility to understand the limits and intent of the site access efforts and include all elements as part of this pay item.
- B. All restoration efforts shall be done in accordance with contract drawings and specifications. It is the contractor's responsibility to understand the limits and intent of the project's restoration efforts and include all elements as part of this pay item.
- C. Existing vegetation or organic matter that is cleared to allow for proper construction shall be removed from the project site and disposed of properly, as part of this item, and at no additional cost to the owner. No vegetation or organic matter shall be buried on site, used in backfill or disposed of inappropriately or in an illegal matter.
- D. All items determined to be removed and replaced, whether by the contractor themselves or by the project professional, shall be identified and be accompanied by construction drawings, details, and material information to be approved by the project professional prior to construction.

3.02 SITE ACCESS

- A. Site access for construction shall be limited to the location shown on contract drawings.
- B. All temporary removal of utilities shall be coordinated with local utility departments. Any fixtures, signage, etc. shall be preserved and restored in similar, undamaged condition.

3.03 SITE RESTORATION

- A. If artifacts are discovered during construction, work is to stop, in the immediate area of the artifact discovery as well as any legitimately suspected artifact areas, and the project Engineer and/or the Owner are to be notified immediately.
- B. Any and all turf establishment as part of restoration efforts shall be done in accordance with MDOT Standard Specification 816 – TURF ESTABLISHMENT.

PART 4 - METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. The quantity will not be measured for payment and all costs shall be included in the item Mobilization and General Conditions. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the owner for approval.

END OF SECTION

TREE PROTECTION

SECTION 02 01 20

PART I - GENERAL

I.1 RELATED DOCUMENTS

A. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section including, but not limited to, all Drawings, all specifications, General Conditions, and General Requirements including submittals.

I.2 DESCRIPTION OF WORK

A. Section includes general protection and, if necessary, pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

I.3 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a diameter tape or the average of the smallest and largest diameters at 6 inches above the ground for trees up to, and including, 4-inch size; and 12 inches above the ground for trees larger than 4-inch size.

B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings defined by a circle concentric with each tree at the diameter of the drip line unless otherwise indicated.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

I.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type of the following:

1. Organic Mulch: 1-quart volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
2. Protection-Zone Fencing: Assembled Samples of 12"x12".
3. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.

- C. Maintenance Recommendations: For care and protection of trees affected by construction during and after completing the Work.
- D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
 - 1. Use sufficiently detailed photographs or videotape.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

I.5 QUALITY ASSURANCE

- A. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
- B. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:
 - a. Construction schedule. Verify availability of materials, personnel, and equipment needed to make progress and avoid delays.
 - b. Enforcing requirements for protection zones.
 - c. Field quality control.

I.6 PROJECT CONDITIONS

- A. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil: Topsoil is defined as fertile, friable natural loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, brush, weeds and other litters, and free of roots, stumps, stones larger than ½", and other extraneous or toxic matter harmful to plant growth.
- B. Imported Topsoil: Comply with Section 023100 "Soil Preparation and Fine Grading".
- C. Organic Mulch: Refer to Section 329300 "Plant Materials".
- D. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements. Previously used materials may be used when approved by Landscape Architect.
1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch opening, 0.148-inch- diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch- OD line posts, and 2-7/8-inch- OD corner and pull posts; with 1-5/8-inch- OD top rails; with 0.177-inch- diameter top tension wire and 0.177-inch- diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
 - a. Height: 6 feet.
 2. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb./ft.; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi; secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 8 feet apart.
 - a. Height: 4 feet.
 - b. Color: High-visibility orange, nonfading.
 3. Gates: Single swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width 24 inches.
- E. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes pre-punched and reinforced; legibly printed with nonfading lettering and as follows:
1. Lettering: 3-inch- high minimum, white characters on red background.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. For the record, prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Tie a 1-inch blue-vinyl tape around each tree trunk at 54 inches above the ground.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated.
 - I. Apply 4-inch average thickness of organic mulch. Do not place mulch within 6 inches of tree trunks.

3.3 TREE- AND PLANT-PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people and animals from easily entering protected area except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
 1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
 2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support.
 3. Access Gates: Install where indicated; adjust to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

- B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations. Install one sign spaced approximately every 50 feet on protection-zone fencing, but no fewer than four signs with each facing a different direction.
- C. Maintain protection zones free of weeds and trash.
- D. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations. See Section 3.9: Repair and Replacement.
- E. Maintain protection-zone fencing and signage in good condition and remove when construction operations are complete and equipment has been removed from the site.
 - 1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
 - 2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Division 31 Section "Earth Moving."
- B. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.
- C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction and as required for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 ROOT PRUNING

- A. Prune roots that are affected by temporary and permanent construction. Prune roots as follows:
 - 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.

2. Cut Ends: Coat cut ends of roots more than 1-1/2 inches in diameter with an emulsified asphalt or other coating formulated for use on damaged plant tissues and that is acceptable to arborist.
 3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
 4. Cover exposed roots with burlap and water regularly.
 5. Backfill as soon as possible according to requirements in Division 31 Section "Earth Moving."
- B. Root Pruning at Edge of Protection Zone: Prune roots 12 inches outside of the protection zone, by cleanly cutting all roots to the depth of the required excavation.
- C. Root Pruning within Protection Zone: Clear and excavate by hand to the depth of the required excavation to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches as follows:
1. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
 2. Pruning Standards: Prune trees according to ANSI A300 (Part 1) and the following:
 - a. Type of Pruning: Cleaning.
 - b. Specialty Pruning: Restoration.
 3. Cut branches with sharp pruning instruments; do not break or chop.
 4. Do not apply pruning paint to wounds.
- B. Chip removed branches and dispose of off-site.

3.7 REGRADING

- A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.
1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.
- C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

- D. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.8 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations.
1. Submit details of proposed root cutting and tree and shrub repairs.
 2. Have an arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
 3. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
 4. Perform repairs within 24 hours.
 5. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by Landscape Architect.
- B. Trees: Remove and replace trees indicated to remain that are more than 40 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Landscape Architect determines are incapable of restoring to normal growth pattern.
1. Provide new trees of same size and species as those being replaced for each tree that measures 6 inches or smaller in caliper size.
 2. Provide one new tree of 6-inch caliper size for each tree being replaced that measures more than 6 inches in caliper size.
 - a. Species: Species selected by Landscape Architect.
 3. Plant and maintain new trees as specified in Section 02900 "Planting."
- C. Soil Aeration: Where directed by Landscape Architect, aerate surface soil compacted during construction. Aerate 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch- diameter holes a minimum of 12 inches deep at 24 inches O.C. Backfill holes with an equal mix of augured soil and sand.

3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off Commission's property.

PART 4 - METHOD OF MEASUREMENT

4.01 TREE PROTECTION

1. The different work items associated with Tree Protection will be measured for payment as Lineal Foot. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.

PART 5 - BASIS OF PAYMENT

5.01 TREE PROTECTION

The basis of payment shall be as noted below for steel railing and will include, but not limited to, all items scheduled and listed herein. The amount bid shall include all labor, materials and equipment required to complete the work.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
020120.01	TREE PROTECTION	Linear Foot

END OF SECTION

SOIL PREPARATION AND FINE GRADING

SECTION 02 31 00

PART I - GENERAL

I.1 RELATED DOCUMENTS

- A. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section including, but not limited to, all Drawings, all Specifications, General Conditions, and General Requirements including submittals.
- B. Related Sections:
 - 1. Section 32 93 00 Planting Trees and
 - 2. Section 32 92 00 Seed and Sod

I.2 DESCRIPTION OF WORK

- A. The work of this Section consists of soil preparation and fine grading. Fine grading is defined as earthwork where the change in finished elevation is less than 0.1 feet cut or fill.
- B. All work will also include the preservation from injury or defacement of all vegetation and objects designated to remain as shown on the Drawings.

I.3 STANDARDS AND DEFINITIONS: The following standard(s) as referenced herein are applicable in their entirety to work of this Section.

- A. ASTM: American Society for Testing and Materials.
- B. AASHTO: American Association of State Highway and Transportation Officials.

I.4 EXAMINATION OF SITE AND DOCUMENTS

- A. Inspect the site prior to beginning work and request clarification regarding the disposition of any conditions that are not shown on the Drawings.

I.5 SAMPLES AND SUBMITTALS

- A. Prior to the start of earthwork operations, Contractor shall determine typical soil conditions on site. Contractor will test each existing soil type
- B. Soil Samples: Provide three 1 quart soil samples of each existing soil type for agricultural suitability analysis, testing, analysis, and approval. Deliver samples to testing laboratories, and have the testing report sent directly to the Owner's Representative and pay all costs. Take soil samples in three equidistant locations within each soil type area. At each location, excavate a hole 12 inches deep and 12 inches in diameter. With one hand, hold a 1 quart zip-lock plastic bag open at the bottom of the hole and evenly scrape soil from one wall of the top 6 inches of the hole into the bag so that the sample is a homogenous mix of soil from the top 6 inches. Seal and label each bag prior to delivering to the testing laboratory. Outline the existing soil type areas on the project Grading Plan and locate the three sample test pits in each area labeling them: 1a, 1b, 1c etc. Submit copy of annotated Grading Plan

with laboratory test data for each sample, to Owner's Representative. Ensure that testing samples and reports have the appropriate corresponding numbers printed on them. Reports shall include the following tests and recommendations.

1. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System. A hydrometer shall be used to determine the percentage each of clay and silt. Label the soil type for each sample according to the USDA classification system, i.e.: Sandy Loam etc.
 2. Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 degrees F, plus or minus 9 degrees.
 3. Tests will include tests for hazardous elements as determined by the Owner's Representative.
- C. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, extractable Aluminum, Soluble Salts, and acidity (pH) and buffer (pH).
- D. Tests, as specified, for gradation, organics, soil chemistry and pH shall be performed by a public extension service or a private testing laboratory approved by the Landscape Architect. Private testing lab will be one approved by the Michigan State University Extension Service.
- E. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish particular seeding, sodding, and planting objectives shown on Drawings and specified herein.
- F. All tests shall be performed in accordance with the current standards of the Association of Official Analytical Chemists. Organics or compost lab analysis of product being bid shall be performed by a US Composting Council STA-certified lab.
- G. Test Analysis for organic compost shall indicate the following: Bulk Density, % Inorganics, % Moisture, Particle Size Distribution, Primary, Secondary Nutrients, Trace Elements, Organic Matter Expressed in Percentage and Pounds per CY, Ag Index, pH, Soluble Salts, Maturity Indicators: Ammonia N/Nitrate N Ratio, Carbon to Nitrogen Ratio
- H. Certified Test Data for all soil amendments including sand, organics, fertilizers and all other amendments.
- I. Provide compaction testing in landscape areas as required by section 3.03 prior to beginning finish work.
- J. Manufacturer's product literature and test data for all soil amendments including:
1. Sand, mechanical gradation sieve analysis, source, and 1 quart sample.
 2. Compost, mechanical a chemical analysis, lab analysis, total volume of compost being calculated for application.
 3. Source, and 1 quart sample.
 4. Fertilizer, chemical analysis and manufacturer's product literature.

I.6 PERMITS, CODES, AND SAFETY REQUIREMENTS

- A. Comply with all rules, regulations, laws and ordinances of the City and State, and all other authorities having jurisdiction over the project site. All labor, materials, equipment and services necessary to make the work comply with such requirements shall be provided by the Contractor.
- B. Comply with the provisions of the Manual for Accident Prevention in Construction of the Associated General Contractors of America, Inc., and the requirements of the Occupational Safety and Health Administration, United States Department of Labor.
- C. Ensure that the Owner's Representative has acquired all permits and licenses required to complete work specified herein and shown on the Drawings.
- D. Do not close or obstruct any street, sidewalk, or passageway without permission from the Owner's Representative.

I.7 LAYOUT AND GRADES

- A. Licensed Surveyor or Civil Engineer: Employ a licensed land surveyor or civil engineer licensed in the state of Michigan to stake out lines and levels.
- B. The Contractor will survey and layout work required for construction. Ensure that lines and grades have been established prior to beginning work.
- C. The words "finished grade" as used herein shall mean final grade elevations indicated on the Drawings. Project site areas shall be given uniform slope between points for which finished grades are indicated or between such points and existing established grades except at the top and toe of slopes where curving, smooth and continuous slopes will be established.

I.8 PROTECTION OF EXISTING CONDITIONS

- A. All rules and regulations governing the respective utilities shall be observed during the execution of the work under this Section. All work shall be executed in such a manner as to prevent any damage to existing buildings, streets, curbs, paving, service utility lines, structures and adjoining property.
- B. Locate and mark underground utilities to remain in service before beginning work.
- C. Protect all existing utilities to remain during operations. Do not interrupt existing utilities except when authorized in writing by authorities having jurisdiction.

I.9 QUALITY ASSURANCE

- A. Contractor will have not less than three years experience in the successful completion of the work specified.
- B. Submit certificates of inspection, required by law, for transportation of materials with invoice. File copies of certificates after acceptance of materials on-site.

- C. Inspection and/or certification of product at point of origin does not preclude rejection of materials at project site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. GENERAL

- 1. Fill materials shall conform to the following material descriptions. AASHTO T111, T27 and AASHTO M145 shall determine gradation requirements.

B. PLANTING SOIL MIX FOR PLANTING BEDS

- 1. Topsoil is defined as fertile, friable natural loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, brush, weeds and other litters, and free of roots, stumps, stones larger than 1/2", and other extraneous or toxic matter harmful to plant growth.
- 2. It is anticipated that all existing soils can be tilled and that amendments will be tilled into the existing soils to conform with specifications for Planting Soil Mix. If claystone and other areas that are not tillable are encountered, contractor will remove existing material to a minimum depth of 12 inches below proposed finish grade then rip the underlying material to a depth of 24 inches below proposed finish grade and place Planting Soil Mix meeting the requirements of these specifications over the ripped area (to a depth of not less than 12 inches.)
- 3. Amended existing soil will comply with the following Planting Soil Mix specifications. Planting Soil Mix mechanical analysis will comply with the requirements for "fine sandy loam" or "sandy loam" as determined by mechanical analysis (ASTM D-422) and based on the "USDA Classification System". Planting Soil Mix shall have the following mechanical analysis:

<u>Textural Class</u>	<u>Percentage of Total Weight</u>	<u>Average Percentage</u>
Sand (0.05 - 2.0 mm dia. range)	45 - 75	50
Silt (0.002-0.05 mm dia. range)	15 - 35	35
Clay (less than 0.002 mm dia. range)	5 - 20	15 max.

- 3. The maximum retained on a Number 10 sieve shall be 15 percent by weight, 20 percent by volume of the total sample.
- 4. Planting Soil Mix shall not contain less than 2 percent nor more than 4 percent organic matter as determined by the loss on ignition of oven-dried samples.
- 5. The acidity range of the Planting Soil Mix shall be pH 6.0 to 7.5.
- 6. Planting Soil Mix shall be free of debris and other extraneous matter. It shall be uncontaminated by salt, stumps, roots, rocks larger than 1/2 inch, brush, noxious weed seed, reproductive vegetation plant parts, heavy clay, hard clods, toxic substances, foreign matter and substances harmful to plant growth. The electrical conductivity

(EC2) of a 1:2 soil-water suspension shall be equal to or less than 1.0 milliohms/cm. (Test minus sieve Number 10 material). Soils shall not have levels of Aluminum greater than 200 parts per million.

7. No soil preparation shall be done on the site until the review and approval of Planting Soil Mix test results and recommendations by the Owner's Representative, but such approval shall not constitute final acceptance. The Owner's Representative will reject any material delivered to the site which, after on-site, post-delivery testing, does not meet these specifications.

2.2 SOIL ADDITIVES

- A. Sulphur for adjustment of Planting Soil Mix pH shall be commercial or flour Sulphur, unadulterated, and shall be delivered in containers with the name of the manufacturer, material, analysis and net weight appearing on each container.
- B. Organic soil additives shall be natural humus, free from excessive amounts of zinc, low in wood content, free from hard lumps and in a shredded or granular form. According to the methods of testing of A.O.A.C., latest edition, the acidity range shall be approximately 5.5 pH to 7.6 pH and the organic matter shall be not less than 85%. The minimum water absorbing ability shall be 200% by weight on an oven-dry basis. Acceptable materials are:
 1. Maximum 10% retained on a #50 mesh screen.
 2. pH of 3 to 5.
 3. Maximum 20% inert ingredient.
 4. Minimum 80% organic matter with 40% minimum humic acid.
- C. Humate:
Humate shall conform to the following:
 1. Maximum 10% retained on a #50 mesh screen.
 2. pH of 3 to 5.
 3. Maximum 20% inert ingredient.
 4. Minimum 80% organic matter with 40% minimum humic acid.
- D. Mycorrhizae Fungus:
Mycorrhizae shall conform to the following:
 1. Powder form to be added to hydromulch mixture, 100,000 spores/lb.
 2. Minimum three endomycorrhizal species.

The Contractor shall submit a 2 lb. sample of the humate and fertilizer product and ¼ lb. sample of the mycorrhizae product four weeks before its use on the project site for the Landscape Architect's approval. A Certificate of Compliance shall be provided to the Landscape Architect to verify the organic matter content, and pH of the humate product.

All soil to be seeded and/or sodded shall be amended with the humate and fertilizer product. The method of incorporation of amendments shall result in a uniform application of material as approved.

Liquid apply liquid organic fertilizer/humate/mycorrhizae mixture with hydro-seeder hose. Hydro-mulching will occur within 24 hours of hand broadcasting of seed. If hand broadcast application to be used, 150% of drill seed application rate per acre of seed mix for hand broadcast areas only. Rake broadcast seed.

Dry organic fertilizer may be substituted for compost for up to 50% in sodded areas and up to 100% in seeded areas. For the purposes of this substitution 1 cubic yard of compost will be considered equivalent to 10 lbs of Dry Organic Fertilizer.

- E. Sand
1. Physical Properties (dry weight basis): at least 95 percent will pass a no. 20 sieve and no more than 20 percent will pass a no. 200 sieve. The sand shall be a naturally occurring smooth washed sand free from sharp, angular, interlocking fragments.
 2. Chemical Properties:
 - a. Salinity: The saturation extract conductivity shall not exceed 3.0 milliohms/cm @ 25 degrees C.
 - b. Boron: The concentration in the saturation extract shall not exceed 1.0 ppm.
 - c. Sodium: The sodium absorption ratio (SAR) as calculated from analysis of the saturation extract shall not exceed 6.0.
- F. Gypsum: Agricultural grade product containing 80% minimum calcium sulfate.
- G. Iron Sulfate (Ferric or Ferrous): Supplied by a commercial fertilizer supplier, containing 20% to 30% iron and 35% to 40% Sulfur.
- H. Sulfate of Potash: Agricultural grade containing 50% to 53% of water-soluble potash.
- I. Single Superphosphate: Commercial product containing 20% to 25% available phosphoric acid.
- J. Ammonium Sulfate: Commercial product containing approximately 21% ammonia.
- K. Ammonium Nitrate: Commercial product containing approximately 34% ammonia.
- L. Calcium Nitrate: Agricultural grade containing 15-1/2% nitrogen.
- M. Urea Formaldehyde: Granular commercial product containing 38% nitrogen.
- N. I.B.D.U. (Iso-Butyldiene Diurea): Commercial product containing 31% nitrogen.
- O. Iron Sequestrene: Geigy Iron Sequestrene 330 Fe.

2.3 PRE-EMERGENT WEED CONTROL:

- A. To be used in all areas to receive sod as required: Utilize Preen Lawn Broadleaf Weed Control manufactured by Lebanon Seaboard Corporation, 1600 East Cumberland Street, Lebanon, PA 17042. Verify that weed control products utilized meet current state laws. Other acceptable manufacturers are: WOW!® Supreme™ Pre-Emergent Weed Control And Lawn Fertilizer manufactured by Garden Alive, 5100 Schenley Place, Lawrenceburg IN, 47025; or Portorate Pre-Emergent Herbicide Granules manufactured by GreenLight, P.O. Box 17985, San Antonio, TX, 78217-0985.

2.4 WATER:

- A. Clean, fresh and potable, as required for dust mitigation and soil compaction under this section of work.

PART 3 - EXECUTION

3.1 GRADES AND ELEVATIONS

- A. The Drawings indicate alignments, grade elevations and invert elevations. Establish the lines and grades in conformity with the Drawings. The Owner's Representative, however, will

make such adjustments in the field as are found necessary in order to avoid interference with any special conditions encountered.

- B. Project areas shall be given uniform slopes between points for which finished grades are indicated or between such points and existing established grades. All seeded, sodded, and planting areas shall slope at a minimum of 2%. Round the tops and toes of all slopes as directed by Owner's Representative. Notify Owner's Representative of any conditions that are encountered that will not allow adequate surface slope and request direction before proceeding.
- C. Coordinate with the Owner's Representative so that suitable grade stakes are located and maintained until finish grade is accepted. Maintain sufficient reference points at all times during construction to properly perform the contract installation.

3.3 FILLING, BACKFILLING AND COMPACTION

- A. Grading:
 - 1. Sub-grade shall be the graded surface prior to any fills.
 - 2. At the completion of excavation and before placing any fills, compact subgrades that are determined to be unconsolidated, to the same compaction levels required for placed fills as required hereinafter.
 - 3. Do not place fill that is too wet or too dry to be compacted to the required density. De-water or add water as required to comply with specifications.
 - 4. Compaction of each lift shall be as specified herein and as determined by ASTM Test, Designation D1556. Fill shall be placed in successive horizontal lifts no thicker than eight inches and compacted to the required density as specified herein. Maximum dry density shall be determined in accordance with ASTM D698, Standard Proctor Density (SPD). The following percentages of maximum dry densities shall be achieved for fill materials or prepared subgrades.
 - a. Within seeding, sodding, and planting areas:
 - 1) All fills to within 12 inches of finished subgrade 90% SPD
 - 2) Top 12 inches to finished grade 80-85% SPD
- B. Placing Planting Soil Mix, Sandy Soil, and Compacting:
 - 1. It is anticipated that rough graded soils in landscape areas will be highly compacted from construction traffic prior to soil preparation and will require tilling prior to planting. The determination of whether to till placed soils will be made by the Landscape Architect based upon compaction testing of existing soils by Project Architect. For the purposes of estimating, the Contractor will assume that all soils in proposed seeding, sodding, and planting areas will require tilling in order to meet specified compaction densities. Tilling will be assumed to be accomplished with the placement of soil amendment to the depth of 12 inches as specified herein.
 - 2. Soil Preparation areas as shown on Drawings, shall be free of construction debris, refuse, compressible or decayable materials and standing water. Do not amend soil when soil materials or material below it are frozen. No fill materials containing ice or frozen lumps shall be used.
 - 3. In the case of lawn and planting areas, compaction requirements for sub-

grades and fills shall be considered minimums and maximums within the density percentages called for. Any over-compaction of sub-grades or fills which does not allow for the free percolation of surface water shall be corrected by loosening sub-grades or fills through tilling or other means and re-compacting to specified compaction limits.

3.4 SOIL PREPARATION

- A. Organic and Chemical Soil Amendments: For areas that are tillable, harrow or chisel existing soil to a minimum depth of 6 inches and place required soil amendments evenly over each area making a minimum number of machine passes. Till soil amendments into the existing soil using a disc harrow or rototiller as long as the amendments are incorporated to the specified depth. Evenly compact prepared soils to achieve specified densities. Do not over compact. Over compacted soils will be ripped and re-compacted to meet specifications.
- B. Following soil preparation, any areas that pond water on the surface will be ripped, amended, and recompact as necessary to ensure specified surface drainage and free soil percolation.

3.5 FINISH GRADING

- A. General:
 - 1. Grade smooth all planting areas after weeding, Planting Soil Mix spreading, soil preparation, and soil conditioning have been completed and soil has been thoroughly compacted.
 - 2. Provide all grades for natural runoff of water without low spots or pockets. Accurately set flow line grades at 2% minimum gradient unless otherwise noted in Drawings.
 - 3. Finish grades shall be smooth, even and on a uniform plane with no abrupt changes of surface. Slope uniformly between given spot elevations. Minimum slope on lawn areas will be 2 percent, and maximum slope in sod areas will be 4:1.
 - 4. Grades not otherwise indicated shall be uniform levels or slopes between points where elevations are given, or between points established by walks, paving, curbs or catch basins except at tops and toes of slopes.
 - 5. Tops and toes of all slopes shall be rounded to produce a gradual and natural-appearing transition between relatively level areas and slopes.
- B. Grades:
 - 1. Tolerance: All planting areas, including lawn areas, shall be true to grade within 1 in. when tested in any direction with a 10 ft. straightedge.
 - 2. Finished Grades:
 - a. Sodded areas: 1 inch below adjacent pavement, curbs, or headers.
 - b. Seeded areas: 1/2 inch below top of adjacent pavement, curbs or headers.
 - c. Shrub beds to receive mulch: 3 inches below top of adjacent pavement curbs, or headers.

3.6 CLEANUP

- A. At the end of all filling and grading operations and before acceptance of the work, the

Contractor shall remove all debris, rubbish, etc., from the site. The premises shall be left clean and presentable to the Owner's satisfaction.

PART 4 - METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. The quantity will not be measured for payment and all costs shall be included in the item Machine Grading, Modified. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the owner for approval.

END OF SECTION

PART I - GENERAL**I.01 SUMMARY**

- A. In accordance with pertinent provisions of this section, carefully demolish and remove from the site those landside items scheduled to be demolished and removed including, but not limited to, the following:
1. Concrete Sidewalk
 2. Concrete Curb and Gutter
 3. Restroom
 4. Timber Stairs
 5. Boardwalk
 6. Steel Grate
 7. Timber Sidewalk
 8. Electrical Boxes
 9. Light: Pedestrian
 10. Light: Bollard
 11. Irrigation System
 12. Regulatory Signs
 13. Dumpster Enclosure
 14. Fence
 15. Footwash
 16. Mill Asphalt
 17. Remove Asphalt
 18. Sanitary Line - Abandon
 19. Drainage Structure

20. Adjust Drainage Structure

B. Of those items listed above, carefully remove, salvage and relocate the following items for inspection and salvage:

1. Steel Sculpture
2. Tierney Bust
3. Flagpoles
4. Landscape Boulders
5. Topsoil

I.02 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

I.03 SUBMITTALS

A. Prepare and follow an organized plan and schedule for removal of items.

1. Completely remove items scheduled to be so demolished and removed, leaving surfaces clean, solid, and ready to receive new materials specified elsewhere as work progresses. Saw cut limits of concrete items to be removed. Grind edges of removed surface steel that is embedded in concrete surfaces or removed/cut edges of steel that remains. Legally dispose of all removed items, materials.
2. In all activities, comply with pertinent regulations of governmental agencies having jurisdiction.

I.04 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 02009 – Site Conditions.

PART 2 - PRODUCTS

(NO PRODUCTS ARE REQUIRED IN THIS SECTION)

PART 3 - EXECUTION

3.01 SITE CONDITIONS

- A. All site item removals, excavation and fill, construction item removal; repair work, must be done by site construction equipment. Any damage to existing surfaces/structures/utilities to remain caused by Contractor's operations must be repaired at no additional cost to Owner.
- B. Examine the areas and conditions under which work of this section will be performed. Correct conditions which are detrimental to timely and property completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Prior to demolition, Contractor to confirm existing utility lines with Owner/Engineer. The Contractor must indemnify, defend, and save harmless the Owner and the Professional against all damages or alleged damages to any such utility arising out of the work.

3.03 STRUCTURE AND ITEM REMOVALS

All associated costs with disposal shall be included in the various removal items

- A. Carefully remove concrete sidewalk and concrete pavement with minimal upland disturbance. Any damages to existing sidewalk to remain will be fixed or replaced at no cost to the owner and at the discretion of the project professional.
- B. Saw cut all pavement to full depths, as needed, prior to removal.
- C. Remove Restroom Structure which will include all foundations as well as any other items associated with the marina structure.
- D. Remove Stairways, Boardwalk, Steel Grate Path and Timber Sidewalk will include all foundations as well as any other items associated with the stairway/walkway structures.
- E. Remove Electrical Boxes and Light Bollard will include all work associated the removal of the box, wiring, conduit, foundations as well as any other items associated with the Electrical Boxes and Light Bollard.
- F. Remove Swing Set, Climber, Fence, Foot wash, Regulatory Signs, Litter Bins, Grills, Fixed Picnic Tables will include all work associated with the removal of these structures and foundations as well as any other items related to these structures.
- G. Remove Irrigation System will include all work associated with the removal of the control panel, backflow preventer, visible piping, above ground sprinkler heads, ground sprinkler heads, drip irrigation, sprinkler heads, valve boxes and meter pit as well as any other items related to this system.
- H. Remove Regulatory Signs which will include approximately 15 signs i.e. ADA, directional, etc.
- I. Remove Dumpster Structure which will include all foundations, pads, slabs, bollards as well as any other items associated with the dumpster structure.
- J. Remove Footwash will include all work associated with the footwash removal as well as safe abandonment of the water supply line.

- K. The Sanitary line Abandon will include all work associated with the placement of flowable fill in this line.
- L. The freestanding picnic tables and bike racks shall be salvaged and delivered to the Village for their use.
- M. The Benches, Steel Sculpture, Tierney Bust and Flagpoles, noted to be relocated, will include all work associated with the careful removal from their current location to the proposed locations as noted on the plans. All work associated with these tasks will be included in their respective bid items.
- N. The noted Landscape Boulders will be relocated to the various landscape portions of the project as noted on the landscape plans.
- O. Topsoil Salvage will include the removal of the existing topsoil, for the purpose of installing the proposed improvements, and stockpiled at appropriate locations throughout the site for re-use in the landscaping improvements.

3.04 DEMOLITION AND REMOVALS

- A. The Contractor must removal all items as indicated on drawings and in contract documents. Coordinate, schedule and cooperate with Owner.
- B. By careful study of the Contract Documents, determine the location and extent of removals to be performed.
- C. In company with the Professional, visit the site and verify the extent and location of removals required.
 - 1. Carefully identify limits of removals.
 - 2. Mark interface surfaces as required to enable workmen also to identify items to be removed and items to be left in place intact.
- D. Use whatever means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

3.05 DISPOSAL AND RECYCLE

- A. The Contractor will be required to remove all materials, rubble and debris from the site as the work progresses. Contractor demolished material must be considered to be property of the Contractor and must be completely removed from the job site.
 - 1. If Contractor does not salvage materials, he must legally dispose of removed materials.
- B. The burning of combustible materials at the site will not be permitted.
- C. All hauling must be done in such a manner as to avoid spillage on Village streets and road right-of-ways. The Contractor must be responsible for dust control and for cleaning up all spillage. This applies both on site and off site.

3.06 REPLACEMENT

- A. In the event items not scheduled to be demolished are removed, promptly replacing such items to the approval of the Professional and at no additional cost to the Owner.

PART 4 - METHOD OF MEASUREMENT**4.01 SITE DEMOLITION AND REMOVALS**

- A. Site Demolition and Removals will be measured as noted below.

PART 5 - BASIS OF PAYMENT**5.01 SITE DEMOLITION AND REMOVALS**

The basis of payment shall be as noted below for site demolition and removals and will include, but not limited to, the demolition, removal, disposal, associated fees and any incidental for the demolition and removal of all landside items scheduled for demolition and listed herein. The amount bid shall include all labor, materials and equipment required to complete the work.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
024100.01	SIDEWALK REMOVAL	Square Yard
024100.02	CURB AND GUTTER, REM	Foot
024100.03	RESTROOM REMOVAL, COMPLETE	Lump Sum
024100.04	TIMBER STAIRS, REM	Each
024100.05	BOARDWALK, REM (NIC)	Lump Sum
024100.06	STEEL GRATE, REM (NIC)	Lump Sum
024100.07	TIMBER SIDEWALK, REM	Square Yard
024100.08	ELECTRICAL BOXES, REM	Lump Sum
024100.09	LIGHT: PEDESTRIAN, REM	Each
024100.10	LIGHT: BOLLARD, REM	Each
024100.11	IRRIGATION SYSTEM, REM	Lump Sum
024100.12	REGULATORY SIGNS, REM	Lump Sum

024100.13	DUMPSTER ENCLOSURE, REM (SALVAGE DOORS)	Lump Sum
024100.14	FENCE, REM	Feet
024100.15	FOOTWASH, REM	Each
024100.16	HMA SURFACE MILL, REM	Square Yard
024100.17	HMA, REM	Square Yard
024100.18	SANITARY LINE, ABANDON	Lump Sum
024100.19	STRUCTURE, REM	Each
024100.20	DR STRUCTURE COVER, ADJ, CASE I	Each
024100.21	STEEL SCULPTURE, RELOCATE	Each
024100.22	TIERNEY BUST, RELOCATE	Each
024100.23	FLAGPOLES, RELOCATE	Each
024100.24	LANDSCAPE BOULDERS, RELOCATE	Lump Sum
024100.25	TREE, REM 6 INCH TO 18 INCH	Each
024100.26	TREE, REM 19 INCH to 30 INCH	Each
024100.27	STUMP, REM 6 INCH TO 18 INCH	Each
024100.28	STUMP, REM 19 INCH to 30 INCH	Each
024100.29	TOPSOIL SURFACE, SALV, 5 INCH	Lump Sum

END OF SECTION

EXCAVATION, BACKFILLING, AND COMPACTION

SECTION 02 51 00

PART I - GENERAL

I.1. SUMMARY

- A. This section includes removals, excavation, backfill, compaction, and grading of the site to the elevations shown on the drawings, and as needed to meet the requirements of the construction shown in the Contract Documents.
- B. Related Work: Documents affecting work of this section includes:
 - 1. Section 03 30 00 – Cast in Place Concrete
 - 2. Section 31 25 00 – Soil Erosion and Sediment Control
 - 3. Section 32 12 16 – Bituminous Paving

I.2. QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Use equipment adequate in size, capacity, and numbers to accomplish the work of this Section in a timely manner.
- C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with referenced latest portion of Michigan Department of Transportation (MDOT) "Standard Specifications for Construction"
- D. Codes and Permits:
 - 1. The Contractor must comply with all pertinent standards and regulations, of MDOT and the Municipality. Comply with all permit requirements at no additional cost to the Owner.
 - 2. The Contractor must secure and pay for all construction permits including soil erosion and sedimentation permit. Construction work must comply with these permit stipulations. The Contractor must prepare and submit all necessary reports and formwork required by agency.

I.3. DELIVERY, STORAGE AND HANDLING

- A. Comply with all pertinent provisions of Division I

I.4. SOIL EROSION

- A. The Contractor must take all necessary precautions to prevent soil erosion and sedimentation in areas disturbed by the construction and dewatering pumpage and must prevent soil erosion and sedimentation materials from entering any sewers or natural water

courses. The Contractor must provide temporary filtering means, temporary slope protection, temporary dikes, coffer dams, pumps, settling basins, and filtration, etc. as necessary.

- B. Comply with soil erosion and sedimentation permit and agency requirements at no additional cost to Owner. Comply with Section 31 25 00 – Soil Erosion and Sedimentation Control.

PART 2 – PRODUCTS

2.1 FILL MATERIALS

- C. Fill and Backfill materials:
 - 1. Fill material must be commercial stone or aggregate from a commercial source, subject to the approval of the Professional, free from chert and other deleterious matter or extensive cracks.
 - 2. All granular fill must be MDOT granular Class II fill compacted in layers as indicated from off-site commercial source.
 - 3.
 - 4. For approval of fill material, notify the Professional at least five working days in advance of intention to import material, designate the proposed borrow area, and furnish sample to prove the quality of the material. The Professional must approve testing lab results prior to use.
 - 5.
 - 6. Where aggregate base is called for throughout the project for slabs, landscaping pipe and structure bedding existing structure fill, and below water surface, provide aggregate complying with requirements of MDOT 6A crushed aggregate as indicated on the drawings.
 - 7.
 - 8. Backfill for utilities shall consist of in situ material, subject to approval by the Professional.

2.2 GRADATION SPECIFICATIONS

- A. Aggregate granular material as specified must be clean material with particle size grading within the following limits:
 - 1. MDOT granular Class II gradation as per MDOT Specification Table 902-3
 - 2. MDOT granular Class III gradation as per MDOT Specification Table 902-3
 - 3. MDOT 6A crushed Aggregate gradation requirements as per MDOT Spec. Table 902-1 and 902-2. MDOT 6A Aggregate must be of crushed material.
- B. Furnish copies of gradation tests and certification prior to placement.

2.3 GEOTEXTILE FABRIC

- A. References to specific proprietary products as used to establish minimum standards of utility and quality. Unless otherwise approved by the Professional, provide only the specific products. Design is based on the materials specified.

- A. Provide Non-woven Geotextile filter fabric cloth constructed of polypropylene fibers with the following average physical properties:

Weight	Min. 12.0 oz/yd ²	ASTM D-5261
Grab Strength	300 lbs	ASTM D-4632
Elongation	50%	ASTM D-4632
Water Permeability	Min. 75 gpm/ft ²	ASTM D-4491
CBR Puncture	Min. 850 lbs	ASTM D-6241
UV Resistance	70% @ 500hrs	ASTM D-4355

- B. TerraTex NI2
 Hanes Geo Components
 815 Buxton Street
 Winston-Salem, NC 27101-1310

Or approved equal

2.4 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Professional.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work in 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 SURVEY AND LAYOUT DATA

- A. The Contractor must establish and maintain all lines and levels required for laying out and constructing the work. The Contractor agrees to assume all responsibility due to inaccuracy of any work.

3.3 PROCEDURES

- A. Utilities:
 1. Call “Miss Dig” prior to any excavation.
 2. Unless shown to be removed, protect active utility lines and services shown on the drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.
 3. If active utility lines are encountered, and are not shown on the drawings or otherwise made known to the Contractor, promptly take necessary steps to ensure that service is not interrupted.
 4. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.

5. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Professional and secure his instructions.
6. Do not proceed with permanent relocation of utilities until written instructions are received from the Professional and approved by regulating utility.
 - a. Removals:
 1. Remove existing designated items as required and coordinate with the Owner at no additional cost to the Owner. Sawcut removal limits prior to removal.
 - b. Protection of persons and property:
 1. Barricade and temporary fence open holes and depressions occurring as part of the work, and post warning lights on property adjacent to or with public access.
 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
 3. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this section.
 4. Comply with MDOT Agency requirements and standards.
 - c. Dewatering:
 1. Remove all water, including rainwater, encountered during trench and substructure work to an approved location by pumps, drains, and other approved methods. Comply with soil erosion and sedimentation control permit.
 2. Keep Excavations and site construction area free from water. Construction must be done in the dry.
 - d. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near site at no additional cost to the Owner.
 - e. Maintain access on streets and to adjacent areas and businesses at all times.

3.4 EXCAVATING

- A. Perform excavating of every type of material encountered within the limits of work to the lines, grades, and elevations indicated and specified herein.
- B. Excavate, remove, adjust or add stone to the minimum width necessary for proper installation of the sheeting and ramps.
- C. Satisfactory excavated clean granular materials:

1. Transport to, and place in, nonstructural/parking/sidewalk fill or embankment areas within the limits of the work. Dispose of excess off site.
- D. Unsatisfactory excavated materials:
1. Excavate to a distance below grade as directed by the **Professional** and replace with satisfactory materials.
 2. Include excavation of unsatisfactory materials, and replacement by satisfactory materials, as part of the work in this Section.
- E. Surplus materials: All surplus material from excavation on this project becomes the property of the Contractor and must be transported and deposited at legal disposal site. Disposal must be carried on in an orderly manner. All hauling must be done in such a manner as to avoid spillage on streets or road right-of-ways. The Contractor must be responsible for cleaning up all spillage at the direction of the Professional.
- F. Excavation of materials:
1. Where rock, boulders, concrete, piling, sheeting, wood, rubble, or similar material is encountered in the way or requires removal or adjusting, and where such material cannot be removed or excavated by conventional earth moving or ripping equipment, take required steps to proceed with the general grading operations of the work, and remove or excavate such material by means which will neither cause additional cost to the Owner nor endanger structures whether on or off the site. Notify the Professional and Owner of these conditions.
 2. Before placement of fill materials, inspect the bottom of existing sub-grade for suitability before placement of fill material.
- G. Depressions:
1. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.
 2. Do not excavate below the depth indicated or specified.
- H. Excavate and backfill in a manner and sequence that will provide form bearing at all times.
1. Where utility runs traverse public property or are subject to government or utility company jurisdiction, provide depth, bedding, cover, and other requirements as set forth by legally constituted authority having jurisdiction, but in no case less than the depth shown in the Contract Documents.
- I. Borrow:
1. Site borrow from excavation material must only be used in proposed lawn areas if satisfactory and meets the gradation requirements of MDOT granular Class II fill. Dispose of all excess and unsatisfactory materials.
 2. All MDOT granular Class II fill for utilities, parking, building and site concrete surface construction must come from a commercial source off site.

- J. Ditches and Gutters:
1. Cut accurately to the cross sections, grades, and elevations shown.
 2. Maintain excavations free from detrimental quantities of leaves, stocks, trash, and other debris until completion of the work.
 3. Dispose of excavated materials as shown on the drawings.
- K. Unauthorized excavation:
1. Unauthorized Excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific instruction from the Professional.
 2. The Under-footings, foundations, or Structures:
 - a. Fill unauthorized excavations by extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering the required top elevation.
 - b. When acceptable to the Professional, concrete fill or MDOT 6A aggregate may be used to bring the bottom elevation to the proper position.
 3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations, unless otherwise directed by the Professional.
- L. Stability of base excavation and slopes:
1. Slope sides to 1:1 or flatter, unless otherwise directed by the Professional.
 2. Shore and brace where sloping is not possible because of space restrictions or stability of the materials. Use trench boxes as necessary and required.
 3. Maintain sides and slopes in a safe condition until completion of excavations.
- M. Shoring and bracing:
1. Provide materials for shoring, bracing, trench boxes, fencing etc. as may be necessary for the safety of personnel, protection of work, and compliance with requirements of governmental agencies having jurisdiction.
 2. Maintain shoring and bracing regardless of the time period excavations will be open.
- N. Excavating for structures:
1. Conform to elevations and dimensions shown within a tolerance of 0.10 ft. and extending a sufficient distance from footings and foundations to permit placing and removing concrete form work, installation of services, other required construction, and for inspection.
 2. In excavating for footings and foundations, take care not to disturb the bottom of excavation:
 - a. Excavate by hand tools to final grade just before concrete is placed
 - b. Trim bottoms to required lines and grades to leave solid base to receive concrete
 3. Excavate for footings and foundations only after general site excavating, filling, and grading are complete.
- O. Excavating for pavements:

- I. Sawcut surface of pavements along limits to comply with cross sections, elevations, and grades.

P. Cold weather protection:

- I. Protect excavation bottoms against freezing when the atmospheric temperature is less than 35 degrees F. Provide temporary heating as required. No frost, frozen materials or ice allowed in fill/excavation materials.

3.5 FILLING AND BACKFILLING

A. General:

1. For each classification listed below, place specified soil material in layers to required sub-grade elevations. Compact in layers.
2. In excavations and trench:
 - a. Backfill MDOT granular Class II material.
3. Under asphalt pavements:
 - a. Use granular MDOT Class II fill sub-base materials as indicated.
4. Under sidewalks:
 - a. Use MDOT granular Class II fill with a total minimum 6" depth.
5. Under building footings:
 - a. As indicated or for over excavated areas use MDOT 6A fill
6. Under building slabs:
 - a. Use granular fill complying with MDOT granular Class II and with a total depth to bottom of footings. Place and compact in minimum 8" lifts.
7. Trenches, pipe, and conduit, bedding and backfill:
 - a. In situ material may be used subject to approval by Professional. If native material is not deemed adequate, use 6" minimum MDOT 6A pipe bedding under pipes and around pipe as detailed. Remainder of pipe and conduit trench backfill, above 6A bedding, must be hauled in, MDOT granular Class II material as indicated.

B. Backfill excavations as promptly as progress of the work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, damp-proofing and waterproofing.
2. Inspecting, testing, approving, and recording locations of underground utilities and existing salvaged material.
3. Removing concrete framework.
4. Removing shoring and bracing and backfill any voids with satisfactory materials.
5. Removing trash and debris.
6. Placement of horizontal bracing on vertically supported walls.
7. Take special care in backfilling and bedding operations to not damage pipe and pipe coatings.

C. Surface preparation:

- I. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious matter from ground surface prior to placement of fills.

2. Plow, strip, or break up sloped surfaces steeper than one vertical to one horizontal so that fill and concrete material will bond with existing surface.
 3. When existing ground surface has a density less than that specified under "compacting" for the particular area, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.
- D. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.
- E. Cover:
1. Provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item below the finish grade or sub-grade. Also comply with codes.
 - a. Areas subject to vehicular traffic:

(1) Sanitary sewers:	48"
(2) Storm drains	36"
 - b. Areas not subject to vehicular traffic:

(1) Sanitary sewers:	30"
(2) Storm drains:	18"
 - c. All areas:

(1) Water lines:	60"
(2) Natural gas lines:	24"
(3) Electric conduit:	24"
(4) Electrical ducts:	36"
 - d. Concrete encased:

(1) Pipe sleeves for water and gas lines:	60"
(2) Sanitary sewers and storm drains:	48"
(3) Electrical ducts:	24"
- F. Placing and compacting:
1. Place backfill and fill materials in layers not more than 8" in loose depth.
 2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.
 3. Compact each layer to the required percentage of maximum density for area.
 4. Do not place backfill or fill material on surfaces that are muddy, frozen or containing frost or ice.
 5. Place backfill and fill materials evenly adjacent to structures, to required elevations.
 6. Take care to prevent wedging action of backfill against structures by carrying that material uniformly around the structure to approximately the same elevation in each lift.
 7. Where the construction includes basement or other underground walls having structural floors over them, do not backfill such walls until the structural floors are in place and have attained sufficient strength to support the walls.

3.6 GRADING

A. General:

- I. Uniformly grade the areas within limits of grading under this Section, including adjacent transition areas.
 2. Smooth the finished surfaces within specified tolerance.
 3. Compact with uniform levels or slopes between points where elevations are shown on the Drawings, or between such points and existing grades.
 4. Where a change of slope is indicated on the drawings, construct a rolled transition section having a minimum radius of approximately 8'-0", unless adjacent construction will not permit such a transition, or if such a transition defeats positive control of drainage.
 5. Comply with ADA and ADAAG slope and dimensions requirements in accessible areas such as accessible parking areas, accessible routes, accesses, etc.
- B. Grading outside structure lines:
1. Grade areas adjacent to structures to achieve drainage away from the structures, and to prevent ponding.
 2. Finish the surfaces to be free from irregular surface changes, and:
 - a. Shape the surface of areas scheduled to be under walks and graveled areas to line, grade, and cross-section, with finished surface not more than 0.10 ft above or below the required sub-grade elevation.
 - b. Shape the surface of areas scheduled to be under pavement and slabs to line, grade, and cross-section, with finished surface not more than 0.05 ft above or below the required sub-grade elevation.

3.7 COMPACTING

- A. Control soil compaction during construction to provide the minimum percentage of density specified for each area as determined according to ASTM D-2049.
- B. Provide not less than the following maximum density of soil materials compacted at optimum moisture content for the actual density of each layer of soil material in place, and as approved by the Professional.
1. Structures:
 - a. **Compact existing sub-grades**, the top 8" of sub-grade and each 8" layer of fill material or backfill material at least at 95% of maximum density.
 2. Lawn and landscaped areas:
 - a. **Compact the top 8" of existing sub-grade** and each 12" layer of fill material or backfill material at 90% of maximum density.
 - b. Compact the upper 12" of filled areas, or natural soils exposed (existing sub-grade) by excavating, at 90% of maximum density.
 3. Walks:
 - a. **Compact the top 8" of existing sub-grade** and each 8" layer of fill material or backfill material at 95% of maximum density.
 4. Pavements and graveled areas:
 - a. **Compact the existing sub-grade** and each 8" layer of fill material or backfill material at 95% of maximum density.
- C. Moisture Control:

1. Where sub-grade or layer of soil material must be moisture-conditioned before compacting, uniformly apply water to surface of sub-grade or layer of soil material to prevent free water appearing on surface during or subsequent to compacting operations.
2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to the specified density.
3. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-ready relation tests approved by the Professional.

3.8 DUST CONTROL

- A. The Contactor must control dust from his operations or allowed use by others at no additional cost to the Owner.

3.9 STREET CLEANUP

- A. The Contractor must keep streets clean of spillage for trucking. Limit spillage potential before trucks leave the site or before leaving the loading area to come to the site.

3.10 FIELD QUALITY CONTROL

- A. Secure the Professional's inspection and approval of sub-grades and fill layers before subsequent construction is permitted thereon.
- B. The Contractor will have taken at least the following compaction tests to verify compaction:
 1. At paved areas near structure areas, at least one field density test for every 2,000 sq. ft. of paved area, but not less than three tests.
 2. In each compacted fill layer, one field density test for every 2,000 sq. ft. of paved area, but not less than three tests.
 3. In trenches one every 100 LF of trench per fill layer.

3.11 MAINTENANCE

- A. Protection of newly graded areas:
 1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds.
 2. Repair and re-established grades in settled, eroded, and rutted areas to the specified tolerances.
- B. Where completed and compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

3.12 CERTIFICATION

- A. Upon completion of this portion of the work, and as a condition of its acceptance, deliver to the Professional a written report from the testing lab thru the Contractor certifying that the

compaction requirements have been obtained. State in the report the area or fill or embankment, the compaction density obtained, and the type or classification of fill material placed.

PART 4 – METHOD OF MEASUREMENT

4.1 MEASUREMENT

- A. This work will not be measured separately for payment.

PART 5 – BASIS OF PAYMENT

5.1 PAYMENT

- A. The cost of work described in this section is included in the bid prices of other items.

END OF SECTION

PART I - GENERAL**I.01 REFERENCES AND STANDARDS**

- A. The General Provisions of Michigan Department of Transportation (MDOT), Standard Specifications for Construction, as revised. Materials shall be as specified for concrete sidewalks in MDOT Specification Section 801, 802 and 803 including all appurtenances and incidentals including all sub-grade preparation and testing requirements.

I.02 DESCRIPTION

- A. Provide all labor, equipment, and supervision necessary to complete the work specified in this section.
- B. Scope of work includes:
 - 1. Furnishing and installing concrete sidewalk including all reinforcement, aggregate base material, granular base material, subbase preparation and adjacent site grading as shown on the Contract Drawings. Also included are all expansion and control joints along with all joint materials and labor associated with completing jointing.
 - 2. Furnishing and installing concrete curb and gutter including all reinforcement, aggregate base material, granular base material, subbase preparation and adjacent site grading as shown on the Contract Drawings. Also included are all expansion and control joints along with all joint materials and labor associated with completing jointing.
 - 3. Furnishing and installing Sidewalk Ramp Concrete, 6" including all reinforcement, aggregate base material, granular base material, subbase preparation and adjacent site grading as shown on the Contract Drawings. Also included are all expansion and control joints along with all joint materials and labor associated with completing jointing.
 - 4. Furnishing and installing Concrete Ramp at Pavillion and Concrete Stairs at Pavilion including all reinforcement, aggregate base material, granular base material, subbase preparation and adjacent site grading as shown on the Contract Drawings. Also included are all expansion and control joints along with all joint materials and labor associated with completing jointing
- C. Related work specified elsewhere:
 - 1. Section 02 51 00, Excavating, Backfilling, and Compaction
 - 2. Section 03 30 10 Exposed Aggregate Concrete Paving
 - 3. Section 03 30 20 Integral Colored Concrete

4. Section 33 00 40 Light Foundation

I.03 SUBMITTALS

- A. Secure Statement by ready mix supplier giving source and material certificates, and proportions by weight of cement, fine and course aggregates, and admixtures for the mix designs. Furnish design mix with all materials and proportion including any admixture amounts.
- B. Provide with each load of concrete delivered, duplicate delivery tickets, one for Contractor and one for the Engineer with the following information:
 - 1. Date and serial number of ticket.
 - 2. Name and ready mixed concrete plant, operator, and job location.
 - 3. Type of cement, admixtures, if any, and brand name.
 - 4. Cement content, in bags per cu. yd. of concrete, and mix design
 - 5. Truck number, time loaded, and name of dispatcher
 - 6. Amount of concrete in load, in cu. yd. delivered.
 - 7. Maximum size aggregate.
 - 8. Gallon of water added at job, if any, and slump of concrete after water was added.
 - 9. Temperature of concrete at delivery.
 - 10. Number of revolutions of mixer.

I.04 JOB CONDITIONS

- A. Hot Weather:
 - 1. Comply with ACI 306R.
 - 2. Concrete temperature must not exceed 90°F. At air temperatures of 80°F or above, keep concrete as cool as possible during placement and curing. Cool forms by wash water.
- B. Cold Weather:
 - 1. Comply with ACI 306R.
 - 2. Temperature of reinforcement, forms, fillers, and other materials in contact with concrete at time of placement must not be less than 35°F. Preheat if temperature is below 35°F.
 - 3. Maintain air and forms in contact with concrete sections having minimum dimension less

than 12 inches at temperature above 50°F for at least first 3 days and at temperature above 32°F for remainder of specified curing period.

4. Maintain air and forms in contact with concrete in more massive sections in temperature above 40°F for at least first three days and at temperature above 40°F for at least first three days and at temperature above 32°F for remainder of specified curing period.

PART 2 - PRODUCTS

2.01 REINFORCEMENT

A. Welded Wire Fabric:

1. Provide welded wire fabric complying with ASTM A1064 / A1064M, using sizes and grades as shown on the plans.

B. Rebar

1. ½" (No 4) rebar for concrete abutment and footer per contract drawings.

2.02 FORMS

- A. Design, erect, support, brace and maintain formwork so it will safely support vertical and lateral loads which might be applied until such loads can be supported safely by the concrete structure.
- B. Construct forms to obtain accurate alignment, location, grades and level, and plumb work in the finished structure.
- C. Design of forming system and form bracing system must be the responsibility of the Contractor.

2.03 CONCRETE

- A. Concrete shall be measured, combined and mixed in accordance with ASTM C94, design mixture shall meet the following criteria:

1. Minimum Cement Content: 5-1/2 bags/cu. yard
2. Minimum Strength (28 day): 3,500 psi
3. Air Content: 6% ± 1%
4. Maximum Slump: 4 inches

2.04 JOINTS

- A. Pre-molded expansion joint material and sealant mater must be approved by the Engineer, both for color and placements, prior to its usage.

1. Expansion joint filler material must be pre-molded conforming to ASTM D1751 or ASTM D1742, type I.
2. Joint sealant must conform to Federal Specification TT-S-00227, Type II for vertical joints and Type I for horizontal joints, Class A.

2.05 EQUIPMENT

- A. Equipment used for placing concrete must be of such capacity and so arranged that concrete may be placed as specified. The necessary equipment for concrete operations must be available for inspection, testing, and approval prior to its anticipated use.

2.06 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

2.06 TRENCH DRAIN

- A. Trench Drain as provided by ACO Drain, 9470 Pinecone Dr., Mentor OH 44060 866-823-5062. Or approved equivalent.
 - I. KlassikDrain

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct the conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.
- B. Remove existing turf adjacent to and within concrete sidewalk construction in preparation of the required fill for final grading, per the Contract drawings.

3.02 CONCRETE AND DELIVERY

- A. Transit mix the concrete in accordance with provisions of ASTM C94.
- B. Deliver and complete discharge of mix within 1-1/2 hours of commencing mixing or before 300 revolutions of drum or blades, whichever comes first. This includes revolutions required by transit mix trucks. Limitations may be waived by The Engineer if concrete is of adequate slump after 1-1/2 hours time or 300 revolutions limit has been reached so that it can be placed without addition of water.
- C. Do not add water on job unless authorized by the Engineer. If water is added, additional mixing of 30 drum revolutions is required.

3.03 PLACING CONCRETE

- A. Before concrete is poured all inspections must be completed and approved for all trades, i.e., building, plumbing, electrical, fuel and other applicable inspections by the Construction Code Officials and the Engineer.
- B. Form preparation and removal:
 - 1. Remove foreign matter accumulated in the forms
 - 2. Rigidly close openings left in formwork
 - 3. Wet wood forms sufficiently to tighten up cracks; wet other material sufficiently to maintain workability of the concrete.
 - 4. Use only clean tools.
 - 5. For concrete placed by pumping, any water-cement slurry used to lubricate the inside of the discharge pipe at the beginning of a pour must be disposed of outside.
 - 6. Concrete must is not allowed to freefall more than 5 ft. When concrete is dropped more than 5 ft, the concrete must be deposited through approved pipes or tubes which are at least 6 inches in diameter, and which are arranged to avoid segregation of the concrete. When the reinforcing bars are spaced so close that a 6 in. tube cannot be used, the bar ties must be loosened, and the bars spread enough to permit the use of the tube or chute. Before the bars are covered with concrete, they must be replaced in the correct position and tied.
- E. Conveying:
 - 1. Perform concrete placing at such a rate that concrete which is being integrated with fresh concrete is still plastic.
 - 2. Deposit concrete as nearly as practicable in its final location so as to avoid separation due to rehandling and flowing.
 - 3. Do not use concrete which becomes non-plastic and unworkable, or does not meet required quality control limits, or has been contaminated by foreign materials.
 - 4. Remove rejected concrete from the job site.
 - 5. Do not disturb forms until concrete has adequately cured.
- F. Placing concrete in forms:
 - 1. Care must be taken to avoid damage to reinforcing and ensure their accurate positioning after concrete has been placed.
 - 2. Deposit concrete in horizontal layers not deeper than 24" and avoid inclined construction joints.
 - 3. Remove temporary spreaders in forms when concrete has reached the elevations of the

spreaders.

G. Placing concrete:

1. Deposit and consolidate concrete in a continuous operation, within limits of construction and expansion joints, until the placing of a section is completed.
2. Maintain formwork alignment during and after placing of concrete, in accordance with permissible tolerance limits set forth in ACI 347.
3. Concrete must be within 1/4 inch of 10-ft straightedge in all directions. Deviations from elevation indicated must not exceed 1/4 inch.

3.04 CONSOLIDATION

1. Consolidate each layer of concrete immediately after placing, by use of concrete vibrators supplemented by hand spading, rodding, or tamping.
2. Do not vibrate forms or reinforcement.
3. Do not use vibrators to transport concrete inside the forms.

3.05 JOINTS

A. Expansion joints:

1. Fill fibrous expansion joints with joint sealant as shown on detail drawings.
2. Joint sealer shall be uniformly placed with surface flush with top of concrete.
3. Clean and prime joints in accordance with manufacturer's instructions before applying sealant.
4. Protect applied joint sealant from tracking before sealant has properly dried. Remove improperly applied or tracked sealant using manufacturer approved means.

3.06 CONCRETE FINISHING

- A. Protect finished concrete surfaces from damage caused by construction equipment, materials, or methods, and by rain or running water.
- B. Finished concrete shall have a light broom finish. Broom marks shall be perpendicular to the pedestrian path of travel and parallel to all construction and expansion joints.

3.07 CURING CONCRETE

- A. Wet cure by covering with burlap, plastic sheets, and other approved materials.
- B. Liquid membrane curing:

1. After finishing operations have been completed and immediately after the free water has left the surface, the surface of the concrete must be completely coated and sealed with a uniform later of membrane curing equipment.
 2. The compound must be thoroughly stirred to a uniform consistency in the drum just prior to transfer of the compound to the membrane spraying equipment.
 3. Curing compounds must not be thinned.
 4. The compound must be uniformly applied in one application at a rate of not less than one gallon per 225 square feet of surface.
- C. Protection:
1. Protect from damaging mechanical disturbances, particularly load stressed, heavy shock, and excessive vibration.
 2. Protect concrete from frost, rapid drying and keep moist for minimum curing period of 7 days after placing.
- D. Damage:
1. If rain falls on the newly coated concrete before the film has dried sufficiently to resist damage or if the film is damaged in any other way, the Contractor will be required to apply a new coat of material to the affected area equal in curing value to that specified for the original cost.
 2. All traffic, either foot or otherwise, will be considered as injurious to the film of the applied compound

3.08 ENCLOSURES AND TEMPORARY HEATING

- A. Protect and keep concrete within hot and cold weather curing requirements. Use temporary heating enclosures and heating as required at no additional cost to Owner.

3.09 TESTING

- A. Sampling and testing will be at the discretion of the Contractor and will be performed by and independent testing laboratory and paid for by Contractor. The Contractor responsible for ensuring material brought to the site matches that of the specifications.
- B. Concrete Material: Prior to placement of any concrete, the Contractor must submit to the Engineer for approval (1) copy of the proposed mix.
1. Delivery tickets must be furnished which show mix formulation, Contractor's name, project name, mix identification for each load of concrete delivered and installed. Delivery tickets must show quantity of water added to mix after the load left the batch plant. The Contractor must retain a copy of each delivery ticket for transmittal to the Engineer for evaluation.

2. The engineer reserves the right to require the Contractor to core drill questionable cast-in-place concrete for laboratory testing. Should the laboratory analysis indicate the concrete fails to meet specification requirements, the Contractor must pay all costs for core drilling and testing in the laboratory and replace concrete found to fail meeting the specification requirements. Should the laboratory analysis confirm that the concrete meets specification requirements, the Owner will pay the Contractor for his/her costs for core drilling, concrete patching and the laboratory fee for testing of the concrete core samples.

D. Backfill and Base Compaction

- I. In addition to any requirements spelled out in SECTION 02 51 00 – EXCAVATING, BACKFILLING AND COMPACTION, The Contractor is responsible for maintaining 95% compaction of max density per MDOT standard methods. Any density testing to ensure compaction at 95% of max density will be a responsibility of the Contractor.

3.08 REMEDIAL WORK

- A. Repair or replace deficient work as directed by the Engineer and at no additional cost to the Owner.

PART 4 - BASIS OF MEASUREMENT

4.01 MEASUREMENT

- A. The work for SIDEWALK, CONC. 4 INCH will be measured for payment on a Square Foot basis for completed, finished and cured concrete in place.
- B. The work for CONC PAVT, REINF, 6 INCH will be measured for payment on a Square Foot basis for completed, finished and cured concrete in place
- C. The work for CURB AND GUTTER, CONCRETE, DET F3 and DET D1 will be measured for payment on a Lineal Foot basis for completed, finished and cured concrete in place.
- D. The work for CONC PAVT, REINF, 6 INCH - COLOR WITH EXPOSED AGG will be measured for payment on a Square Foot for completed, finished and cured concrete in place.
- E. The work for SIDEWALK RAMP, CONC, 6 INCH will be measured for payment on an Each basis for completed, finished and cured concrete in place.
- F. The work for DETECTABLE WARNING SURFACE will be measured for payment on an Each basis for completed, finished and installed in place.
- G. The work for CONCRETE STAIRS and RAMP AT PAVILION will be measured for payment on a Each basis for completed, finished and cured concrete in place.
- H. The work for TRENCH DRAIN will be measured for payment on a Lineal Foot basis for completed, finished and installed in place

- I. The work for FOOT WASH DRAIN will be measured for payment on an EACH basis for completed, finished and installed in place

PART 5 - BASIS OF PAYMENT

5.01 PAYMENT

- A. The unit price for the items noted under 4.01 shall include all materials, labor, equipment, transportation, testing, and supervision necessary to complete the items identified herein, and any incidentals necessary for completion of the work specified herein and as shown on the Contract drawings or as directed by the Engineer.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
033000.01	Curb and Gutter, Conc, Det F3	Feet
033000.02	Curb and Gutter, Conc, Det D1	Feet
033000.03	Sidewalk, Conc, 4 Inch	Square Feet
033000.04	Conc Pavt, Reinf, 6 Inch	Square Feet
033000.05	Conc Pavt, Reinf, 6 Inch – Color with Exposed Agg	Square Feet
033000.06	Sidewalk ADA Ramp, Conc, 6 Inch	Each
033000.07	Detectable Warning Surface	Each
033000.08	Concrete Ramp at Pavilion	Each
033000.09	Concrete Stairs at Pavilion	Each
033000.10	Trench Drain	Feet
033000.11	Foot Wash Drain	Each

END OF SECTION

EXPOSED AGGREGATE CONCRETE PAVING

SECTION 03 30 10

PART I - DESCRIPTION

I.1 SUMMARY

A. Section Includes:

1. Special finishing materials and techniques, using chemical surface retarders, for producing decorative exposed aggregate paving finish.
2. Curing and sealing of exposed aggregate surfaces.

I.2 RELATED SECTIONS

A. The following Section(s) contain work related to the work of this Section:

1. Section 03 30 00 – Cast in Place Concrete: General requirements for mixing, placing, and finishing cast-in-place concrete for exposed aggregate finish.
2. Section 03 30 20 – Integral Colored Concrete: General requirements for mixing, placing and finishing cast-in-place concrete with integral color.

I.3 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM C 1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

I.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

B. Review scope of Work expected. Require representatives of each entity directly concerned with concrete slab work to attend, including the following:

1. Contractor's superintendent.
2. Concrete paving subcontractor.
3. Surface retarder manufacturer's representative.
4. Architect's and/or Owner's representative.

C. Review the following, at a minimum:

1. Schedule
2. Extent of Work.
3. Materials to be applied.
4. Procedures to be used for achieving exposed aggregate finish.

5. Mockup panel requirements.
6. Material storage and staging.
7. Temporary heating and tenting.
8. Cleanup and disposal of waste materials.

I.5 ACTION SUBMITTALS

- A. General: Submit the following for approval. Do not proceed with work involving any action submittal until approval is obtained.
- B. Product Data: Technical data sheets for each product used. Include material physical characteristics, storage and application instructions, precautions and safety data, cleanup, and maintenance information.
- C. Shop Drawings: Scaled layout drawings of slab areas to receive exposed aggregate finish. Include location of areas to receive treatment and aggregate exposure degree.
- D. Aggregate blend sample.

I.6 INFORMATIONAL SUBMITTALS

- A. General: Submit the following to the Owner for the Owner's information and records. If acceptable, and unless otherwise indicated, Informational Submittals will not be acted upon or returned.
- E. Safety Data Sheets (SDS) for all products used.
- F. Qualification Data: For Installer.

I.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company regularly engaged in the manufacturing of the products specified in this section, with at least 10 years' successful history manufacturing material specified herein.
- B. Installer Qualifications: Installer who is approved by, or acceptable to manufacturer for application of surface retarders required for this Project, with at least five (5) years' experience in exposed aggregate finishing.
- C. Mock-up Panels: Mock-up to be part of 10' x 10' mock-up as outlined in Section 02020, Concrete Paving. Prepare mock-up to verify proper aggregate and mix design, demonstrate proficiency of the Installer, and determine the best procedures and degree(s) of aggregate exposure. Use methods and materials proposed for use on the final installation, including special aggregates, if required. The approved mock-up panel shall serve as a standard of appearance for the final work to be produced.
 1. Retain approved mockups during exposed aggregate finishing work to serve as a reference for aesthetic intent and quality standard during final application.
 2. Approved mock-ups may not be incorporated into the Work.

3. Demolish and remove mockups at completion of Project.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in original factory packaging, bearing identification of product, manufacturer, batch number, and expiration date.
 1. Furnish Safety Data Sheets to the project superintendent for each product.
- B. Store products in a location protected from damage, construction activity, precipitation and direct sunlight, in strict accordance with the manufacturer's recommendations.
 1. Do not allow liquid products to freeze.
 2. Use products within the published shelf life.
- C. Handle all products with appropriate precautions and care as stated on the Safety Data Sheet.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for ambient temperature and humidity, wind, precipitation, and other conditions affecting surface retarder performance.
 1. Follow hot- and cold-weather concreting procedures specified in Section 02035 – Cast-in-Place Concrete.
- B. Use appropriate measures for protection and supplementary heating to ensure proper curing conditions in accordance with manufacturer's recommendations if application during inclement weather occurs.
- C. Protect adjacent work from contamination due to mixing, handling, and application of surface retarders, curing compounds, and sealers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 1. Dayton Superior Corporation; 1125 Byers Road, Miamisburg, Ohio 45342; Tel: (877) 266-7732; Website: www.DaytonSuperior.com or approved equal.

2.2 MATERIALS

- A. Surface Retarder: Water based top-surface retarder designed to retard the setting (hydration) of the upper layer of cement paste, producing an exposed-aggregate appearance of the concrete surface.
 - I. Product: Dayton Superior "Top Cast" Surface Retarder, or approved equal, as required to achieve intended aesthetic effect:

Product Code	Package Color	Aggregate Size to Expose / Finish
100	Gray	3/8" – 1/2" (9.5 mm – 13 mm)

- B. Aggregate: Well-graded, washed gravel and coarse sand as required to achieve intended aesthetic effect.
 - I. 6A Natural River Rock Aggregate (rounded) as supplied by RediMix Concrete of Detroit, (313) 931-7043. Detroitredadymix.com. Or approved equal.
 - 2. Proportion fine and coarse aggregate per manufacturer's recommendations for size of aggregate to be exposed and to achieve intended aesthetic effect.
- C. Water: Potable and at a temperature of not more than 70 deg F.
- D. Surface Sealer: Clear solvent-based methacrylate non-yellowing sealer, designed to darken and reduce porosity of exposed aggregate concrete surface.

PART 3 - EXECUTION

3.1 GENERAL

- A. All application requirements herein are general, in nature. Actual techniques and procedures shall be as required to achieve acceptable visual effects.
 - I. Refer to other Section 02020 for general requirements for forming, reinforcing, mixing, placing, and finishing concrete pavement work.
- B. Products, techniques, and procedures shall be identical to those used to produce accepted mockups and shall result in visual effects that match mockups as closely as practicable.
- C. Follow all manufacturers' instructions regarding preparation, mixing, and applying materials.

3.2 EXAMINATION

- A. Inspect all areas involved in work to establish extent of work, access, and need for protection of surrounding construction.

3.3 SLAB FINISHING

- A. Finish slab surface per manufacturer's recommendations for exposed aggregate finish(es) indicated, and as required by Section 02020 "Concrete Paving."
- B. Ensure smooth, flat surface, without low spots ("bird baths") which would allow applied materials to puddle.
- C. Ensure no ridges or tool marks remain on slab surface.

3.4 PREPARATION

- A. Ensure that air, material, and surface temperature is at least 40 degrees F and rising prior to beginning application.
- B. Protect all surroundings from overspray of liquid materials, including, but not limited to, adjacent horizontal surfaces, windows, roofs, walkways, drives, and landscaping.
 - I. Apply surface protectant and/or plastic sheeting, sufficiently taped in place.

3.5 SURFACE RETARDER APPLICATION

- A. General: Follow all manufacturer's recommendations and written instructions when applying surface retarder.
- B. Mixing: Mix surface retarder thoroughly prior to each use.
- C. Application:
 - 1. Begin application while slab is still wet, after the evaporation of all bleed water from the surface.
 - 2. Patterns: Where patterns are indicated, provide stencils or masking to areas not to receive each Grade of surface retarder. Seal edges of masking to prevent seepage of surface retarder underneath mask.
 - 3. Apply surface retarder using low pressure sprayer to produce an even, continuous coating.
 - a. Follow manufacturer's recommended coverage rate; do not under-apply.
 - 4. Comply with manufacturer's recommendations regarding rain protection until material is dry.
- D. Removal:
 - 1. Begin removing retarded cement matrix after dwell time recommended by manufacturer, adjusted for field conditions. Unless field conditions substantially differ from those under

which acceptable mockup was produced, begin removal after same time period as was used for mockup.

2. Remove cement matrix with garden hose or 25-degree nozzle power washer.
 - a. Stiff bristle broom or mechanical scrubber may be used as the primary or a supplementary means of removal.
 - b. Take care not to mechanically remove more material than intended by using overly aggressive methods.

3.6 CURING AND SEALING

- A. Curing: Apply curing/sealing compound to slab after water from retarder removal operations has dissipated.
 1. Coverage: Apply at 200 sq. ft. per gallon.
- B. Sealer: Apply two (2) coats of surface sealer to slab after curing/sealing compound has dried.
 1. Clean the surface of dirt, dust, and debris prior to application.
 2. Coverage: Apply at 200 – 300 sq. ft. per gallon (first and second coats).
 3. Coverage:
 - a. First Coat: 200 – 300 sq. ft. per gallon.
 - b. Second Coat: 400 – 600 sq. ft. per gallon.

3.7 CLEANING

- A. Remove all debris and excess materials from the job site and dispose of in accordance with all applicable regulations for waste disposal.

PART 4 – METHOD OF MEASUREMENT

4.1 MEASUREMENT

- A. The work associated with CONCRETE PAVING will not be measured separately for payment. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the owner for approval.

PART 5 – BASIS OF PAYMENT

5.1 PAYMENT

The work associated with EXPOSED AGGREGATE CONCRETE PAVING shall be included in the unit SQUARE FOOT price bid for the CONC PAVT, REINF, 6" – COLOR WITH EXPOSED AGG being installed which includes materials, labor, equipment, transportation, survey control and supervision

necessary to complete the installation of items identified herein, and any incidentals necessary for completion of the specified herein as shown on the Contract drawings or as directed by the Engineer.

END OF SECTION

INTEGRAL COLORED CONCRETE

SECTION 03 30 20

PART I - GENERAL

I.1 SUMMARY

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division I Specification sections, apply to Work of this Section.
- B. Section Includes:
 - 1. Integrally colored concrete pavement, where indicated on the plans.
 - 2. Curing of integrally colored concrete.
- C. Related Sections:
 - 1. Division 3 Section "Cast-In-Place Concrete" for general applications of concrete and coordination of sample submittal and color selection.

I.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 301 "Specification for Structural Concrete for Buildings."
 - 2. ACI 302 IR "Recommended Practice for Concrete Floor and Slab Construction."
 - 3. ACI 303.1 "Standard Specification for Cast-In-Place Architectural Concrete."
 - 4. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing of Concrete."
 - 5. ACI 305R "Recommended Practice for Hot Weather Concreting."
 - 6. ACI 306R "Recommended Practice for Cold Weather Concreting."
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C309 "Liquid Membrane-Forming Compounds for Curing Concrete."
 - 2. ASTM C494 "Standard Specification for Chemical Admixtures for Concrete."
 - 3. ASTM C979 "Standard Specification for Pigments for Integrally Colored Concrete."
- C. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M194 "Chemical Admixtures."

I.3 SUBMITTALS

- A. Product Data: Submit manufacturer's complete technical data sheets for the following:
 - 1. Colored admixture.
 - 2. Curing compound.
- B. Design Mixes: For each type of integrally colored concrete.
- C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available.

- D. Qualification Data: For firms indicated in "Quality Assurance" Article, including list of completed projects.

I.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer with 10-years experience in the production of specified products.
- B. Installer Qualifications: An installer with 5 years' experience with work of similar scope and quality.
- C. Comply with the requirements of ACI 301.
- D. Obtain each specified material from same source and maintain high degree of consistency in workmanship throughout Project.
- E. Notification of manufacturer's authorized representative shall be given at least 1-week before start of Work.
- F. Integrally Colored Concrete Mockups:
 - 1. Provide under provisions of Division 1 Section "Quality Control."
 - 2. At location on Project selected by Landscape Architect, place and finish 10 by 10 feet area representative of horizontal pavement, minimum 4 foot length of stair at least three risers high, and minimum 4 foot length by 3 foot height of planter wall, including intersecting joint between stair and planter wall. Mockup shall not be placed as part of the proposed finished work under any circumstances.
 - 3. For accurate color, the quantity of concrete mixed to produce the sample should not be less than 3 cubic yards (or not less than 1/3 the capacity of the mixing drum on the ready-mix truck) and should always be in full cubic yard increments. Excess material shall be discarded according to local regulations.
 - 4. Construct mockup using processes and techniques intended for use on permanent work, including curing procedures. Include samples of control, construction, and expansion joints in sample panels. Mockup shall be produced by the individual workers who will perform the work for the Project.
 - 5. Retain samples of cements, sands, aggregates and color additives used in mockup for comparison with materials used in remaining work.
 - 6. Accepted mockup provides visual standard for work of Section.
 - 7. Mockup shall remain through completion of work for use as a quality standard for finished work.
 - 8. Remove mockup when directed.

I.5 DELIVERY, STORAGE AND HANDLING

- A. Colored Admixture: Comply with manufacturer's instructions. Deliver colored admixtures in original, unopened packaging. Store in dry conditions.

I.6 PROJECT CONDITIONS

- A. Integrally Colored Concrete Environmental Requirements:
 - 1. Schedule placement to minimize exposure to wind and hot sun before curing materials are applied.
 - 2. Avoid placing concrete if rain, snow, or frost is forecast within 24-hours. Protect fresh concrete from moisture and freezing.
 - 3. Comply with professional practices described in ACI 305R and ACI 306R.
- B. Schedule delivery of concrete to provide consistent mix times from batching until discharge. Mix times shall meet manufacturer's written recommendations.

I.7 PRE-JOB CONFERENCE

- A. One week prior to placement of integrally colored concrete a meeting will be held to discuss the Project and application materials.
- B. The Landscape Architect, General Contractor, Construction Manager, Subcontractor, Ready-Mix Concrete Representative, and a Manufacturer's Representative shall be present.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. L. M. SCOFIELD COMPANY, Douglasville, Georgia and Los Angeles, California (800) 800-9900 or the appropriate local contact: Eastern Division – 201-672-9050; Western Division – 323-720-3055; Central Division Office – 630-377-5959, or approved equal.

2.2 MATERIALS

- A. Colored Admixture for Integrally Colored Concrete: CHROMIX P[®] Admixture only. L. M. SCOFIELD COMPANY “Davis Charcoal Gray”
 - 1. Admixture shall be a colored, water-reducing, mixture containing no calcium chloride with coloring agents that are limeproof and ultra-violet resistant.
 - 2. Colored admixture shall conform to the requirements of ACI 303.1, ASTM C979, ASTM C494 and ASSHTO M194.
- B. Curing Compound for Integrally Colored Concrete: Curing compound shall comply with ASTM C309 and be of same manufacturer as colored admixture, for use with integrally colored concrete.
- C. Curing and Sealing Compound: L. M. SCOFIELD COMPANY. Curing and sealing compound shall comply with ASTM C309 and be of same manufacturer as colored admixture, for use with integrally colored concrete.
- D. SUBSTITUTIONS: The use of products other than those specified will be considered providing that the Contractor requests its use in writing within 14-days prior to bid date. This request shall be accompanied by the following:
 - 1. A certificate of compliance from material manufacturer stating that proposed products meet or exceed requirements of this Section, including standards ACI 303.1, ASTM C979, ASTM C494 and AASHTO M194.
 - 2. Documented proof that proposed materials have a 10-year proven record of performance, confirmed by at least 5 local projects that Landscape Architect can examine.

2.3 COLORS

- A. Concrete Color: Davis #61078, Adobe
 - 1. Cement: Color shall be gray.
 - 2. Sand: Color shall match approved sample.
 - 3. Aggregate: Concrete producer's standard aggregate complying with specifications.
 - 4. Colored Admixture: As selected by Landscape Architect.

2.4 CONCRETE MIX DESIGN

- A. Minimum Cement Content: 6 sacks per cubic yard of concrete.

- B. Slump of concrete shall be consistent throughout Project at 4-inches or less. At no time shall slump exceed 5-inches.
- C. Do not add calcium chloride to mix as it causes mottling and surface discoloration.
- D. Supplemental admixtures shall not be used unless approved by manufacturer.
- E. Do not add water to the mix in the field.
- F. Add colored admixture to concrete mix according to manufacturer's written instructions.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install concrete according to requirements of Division 3 Section "Cast-In-Place Concrete."
- B. Do not add water to concrete mix in the field.
- C. Surfaces shall be finished uniformly with the following finish:
 - I. Broomed: Pull broom across freshly troweled concrete to produce fine texture in straight lines perpendicular to main line of traffic. Do not dampen brooms.

3.2 CURING

- A. Integrally Colored Concrete: Apply curing compound for integrally colored concrete according to manufacturer's instructions using manufacturer's recommended application techniques. Apply curing compound at consistent time for each pour to maintain close color consistency.
- B. Curing compound shall be same color as the colored concrete and supplied by same manufacturer of the colored admixture.
- C. Precautions shall be taken in hot weather to prevent plastic cracking resulting from excessively rapid drying at surface as described in CIP 5 *Plastic Shrinkage Cracking* published by the National Ready Mixed Concrete Association.
- D. Do not cover concrete with plastic sheeting.

3.3 APPLICATORS

- A. For a list of qualified contractors, contact your local Scofield representative or the appropriate Division Office: Eastern Division – 201-672-9050; Western Division – 323-720-3055; Central Division Office – 630-377-5959.

PART 4 – METHOD OF MEASUREMENT

4.1 MEASUREMENT

- A. The work associated with INTEGRAL COLORED CONCRETE will not be measured separately for payment. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the owner for approval.

PART 5 – BASIS OF PAYMENT5.1 PAYMENT

The work associated with INTEGRAL COLORED CONCRETE shall be included in the unit SQUARE FOOT price bid for the CONC PAVT, REINF, 6” – COLOR WITH EXPOSED AGG being installed which includes materials, labor, equipment, transportation, survey control and supervision necessary to complete the installation of items identified herein, and any incidentals necessary for completion of the specified herein as shown on the Contract drawings or as directed by the Engineer.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
033000.05	Conc Pavt, Reinf, 6 Inch - Color with Exposed Agg	Square Foot

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This work shall consist of furnishing and installing a complete steel railing system according to these specifications and according to drawings. Steel railing system shall be a fabricated steel round tubing system in stainless steel.
- B. This work shall include furnishing and installing the steel railing system including stainless steel round tubing, mounting material, including connectors, fasteners, and required accessories necessary to comply with these specifications and contract drawings.
- C. The steel railing shall be provided in locations shown on the drawings.
- D. The following specifications shall be regarded as minimum sizes and standards for design and construction. The Contractor shall verify existing conditions prior to fabrication.
- E. Related work specified elsewhere:
 - 1. Section 03 30 00, Cast in Place Concrete

1.02 QUALITY ASSURANCE

- A. Fabricator Qualifications: Furnish references listing projects of similar size and scope
- B. Structural Performance: Engineer, fabricate, and install railing systems to withstand, when tested per ASTM E 935, loadings required by applicable building and safety codes but not less than the following:
 - 1. Concentrated and uniform loading need not be applied simultaneously
 - 2. Uniform load: 50 pounds per foot (74.3 kg/m) applied at the top in any direction.
 - 3. Concentrated load: 200 pounds (90.6 kg) applied at the top in any direction.
- C. Regulatory Requirements
 - 1. Components and installation are to be in accordance with state and local code authorities.
 - 2. Components and installation are to follow current ADA and ICC/ANSI A117.1 guidelines.
- D. Certifications
 - 1. Furnish certification that all components and fittings are furnished by the same manufacturer or approved by the primary component manufacturer.

2. Furnish certification that components were fabricated and installed in accordance with the proper applicable engineering requirements to meet the specified design loads.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver handrails, guardrails, railing systems, and related components to the job site in good condition and properly protected against damage to finished surfaces.
- B. Storage on site:
 1. Store material in a location and in a manner to avoid damage. Stacking shall be done in a way, which will prevent bending.
 2. Store material in a clean, dry location away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin, or polyethylene sheeting in a manner that will permit circulation of air inside the covering.
 3. Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of material.

1.04 SEQUENCING

- A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.
- B. Coordinate with other site contractors to ensure proper layout of railing with regard to final location of nearby project elements.

1.05 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by the manufacturer for optimum results. Do not install products under environmental conditions outside of acceptable absolute limits.
- B. The Contractor shall have sole responsibility for accuracy of all measurements, estimates of material quantities and sizes, and site conditions that will affect work.

1.06 SUBMITTALS

- A. Shop Drawings:
 1. Show complete layout; plan views, elevations, connections, details for fabrication, relationship to adjoining work, including but not limited to, concrete ramp and concrete stairs, and other installation details. All drawings shall be submitted prior to fabrication for review and approval.
- B. Verification Samples: For railing finish specified, supply one sample, minimum size 6 inches (150 mm) round, representing actual railing product, finish stainless steel and material.
- C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.07 WARRANTY

A. Materials and Workmanship

1. The Contractor shall warrant to the Owner that the materials and workmanship related to the production and installation of the edge protection railing will be free from defects under normal use and service for a period of five (5) years from the date of installation.
2. The Contractor will repair or replace, without cost to the Owner, any part, assembly, or portion thereof, which shall be determined to be defective.

B. Effective Date of Warranty: The effective date of the warranty shall be the date of acceptance by the Owner.

PART 2 - PRODUCTS

2.01 STEEL RAILING SYSTEM

A. Posts, Railings, and Spindles

1. Steel tubing for posts and railings shall be A500 Grade B structural steel tubing with a minimum wall thickness of 0.1875". Spindles shall be A513 steel tubing with a minimum wall thickness of 0.12". Mounting plates shall be 3/8" steel at minimum.

2.02 FABRICATION

A. Stainless Steel Railing System

1. Handrails shall be fabricated in panels as shown on the Contract Drawings.
2. Cut, drill, and punch metals cleanly and accurately. Remove burrs, sharp or rough areas on exposed surfaces.
3. Form work true to line and level with accurate angles and surfaces.
4. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
5. Connections: Fabricate railings with welded connections.
6. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - a) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - b) Obtain fusion without undercut or overlap.
 - c) Remove flux immediately.

- d) At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
7. All open tubing end shall be capped and smoothed prior to finishing. Mount plates should include a 3/4" diameter hole at minimum, centered on post, to allow for any condensation to drain.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Steel Railing System

1. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - a. Use 3/8", Grade 5 bolts to attach railing mounts, per the drawing at minimum. Surface mounting with applicable hardware shall be approved prior to fabrication. Any mounting shall meet all performance requirements.
 - b. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - c. Set railing sections plumb within a tolerance of 1/16 inch in 3 feet.
 - d. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

PART 4 - METHOD OF MEASUREMENT

4.01 STEEL RAILING

- A. The different work items associated with Steel Railing will be measured for payment as Each. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.

PART 5 - BASIS OF PAYMENT

5.01 STEEL RAILING

The basis of payment shall be as noted below for Steel Railing and will include, but not limited to, all landside items scheduled and listed herein. The amount bid shall include all labor, materials and equipment required to complete the work.

Payment will be made under:

UNIT	ITEM NO.	ITEM	PAY
	055200.01	STEEL RAILING - RAMP	Each
	055200.02	STEEL RAILING - STAIRS	Each

END OF SECTION

TIMBER CARPENTRY

SECTION 06 90 00

PART I - GENERAL**I.01 DESCRIPTION**

- A. This section includes the timber carpentry work required throughout the project.
- B. Related sections:
 - 1. Section 06 91 00, Exterior Timber Staircase and Deck Assemblies
 - 2. Section 06 92 00, Exterior Timber Boardwalk Assemblies
 - 3. Section 31 62 29, Driven Timber Piles

I.02 SUBMITTALS

- A. The Contractor must submit the following for review and approval prior to construction:
 - 1. Timber material product information for the treated timber decking, timber joists, and railing components.
 - 2. Product information for all proposed fasteners and connectors.
 - 3. Product information and shop drawings for all railing components.

I.03 QUALITY ASSURANCE

- A. Work shall be performed in accordance with Section 709 of MDOT Standard Specifications.
- B. The Contractor shall provide completed mock-up sections where indicated on the Drawings or as specified elsewhere in the Contract Documents.

I.04 DELIVERY, STORAGE, AND HANDLING

- A. All timber materials must be stored and protected by the Contractor. Materials must be placed on skids and/or racks to prevent water from ponding near materials. Materials must be protected from exposure to the sun prior to incorporation into the work. Materials must be protected during transport to ensure they are not damaged by equipment or strapping. Contractor is responsible for replacing any damaged materials prior to final acceptance by the Owner.

PART 2 – PRODUCTS

2.01 EQUIPMENT

- A. The Contractor must provide any and all equipment need to transport, unload, move, and install the materials required for the work.

2.02 MATERIALS

- A. Joist and Framing Components
 1. Timber joists must be sized per the Contract Drawings. Joists shall be treated per AWWPA Use Category as indicated in the Contract Drawings or as specified elsewhere in the Contract Documents.
 2. Joists must be miter cut to match angle of connecting member.
 3. Joists must be connected to faming members and blocking as shown in the Contract Drawings (or approved equal). Fasteners per connection manufacturer requirements. Alternatively, blocking may be fastened using Simpson LS70 skewable angle clips with Zmax finish. Clips shall be fastened with 0.148 x 1-1/2" hot-dipped galvanized joist hanger nails or 1-1/2" #9 SD Connector screws.
 4. Joists must be anchored to underlying timber beams as shown on Contract Drawings (or approved equal). Fasteners per connection manufacturer requirements.
- B. Railing Components
 1. Timber railing must be sized per the Contract Drawings. Joists shall be treated per AWWPA Use Category as indicated in the Contract Drawings or as specified elsewhere in the Contract Documents.
 2. Railings must be anchored to framing as on Contract Drawings (or approved equal). Fasteners per connection manufacturer requirements.
 3. Welded wire mesh panel to be 3" x 3" x 1/4" diameter hot dipped galvanized after welded steel wire mesh. Panel shall be prepared by cleaning and degreasing, top coat finish shall be "super durable" T.G.I.C. polyester powder coat that is U.V., chip and flake resistant. Panel shall be gloss white and all trimmed areas (exposed metal) shall be painted with galvanizing repair paint (high-zinc-dust-content paint) and gloss block exterior enamel. Submit for Designer approval.
 4. Secure wire mesh panel to backside of top and bottom supports with heavy galvanized fence staples at 8" o.c. Submit for Designer approval.

PART 3 – EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Contractor shall coordinate the requirements of the timber construction with other trades performing the concrete and steel installation.

3.02 INSTALLATION

- A. All timber cuts shall be smooth, even, and match the angle of the adjoining member.
- B. All bolts shall include lock washers or self-locking nuts.

PART 4 – METHOD OF MEASUREMENT

4.01 TIMBER CARPENTRY

- A. The different work items associated with TIMBER CARPENTRY items will be measured as specified in the related specification sections and bid schedule. Contractor shall be responsible for furnishing all labor, materials, equipment, and services necessary to complete the timber carpentry work in accordance with the Drawings, this Specification, and all related Sections, regardless of how individual components are measured for payment.

END OF SECTION

PART I – GENERAL

I.01 DESCRIPTION

- A. This Section includes the design, engineering, fabrication, and installation of an outdoor timber staircase and deck system on a steep slope.
- B. The Contractor shall provide a complete design-build solution, including all labor, materials, equipment, tools, supervision, and incidentals required for the installation of the system.
- C. Work includes, but is not limited to:
 - a. Foundations, to be helical anchors or cast-in-place concrete.
 - b. Timber staircase, landings, and decks.
 - c. Guardrails and handrails.
 - d. Mock-up for approval.
 - e. Drainage and erosion control measures as required.
- D. Related sections:
 - a. Section 06 90 00, Timber Carpentry
- E. References
 - a. Michigan Building Code, 2021
 - b. American Concrete Institute *Building Code Requirements for Structural Concrete*, 2019
 - c. American Society of Civil Engineers Structural Engineering Institute *Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE/SEI 7)*, 2016
 - d. American Wood Council (AWC): *National Design Specification with Supplement (NDS)*, 2018, and *Special Design Provisions for Wind and Seismic (SDPWS)*, 2021
 - e. Others, as prescribed by Authority Having Jurisdiction (AHJ)

I.02 DESIGN REQUIREMENTS

- A. Contractor shall engage a Licensed Professional Engineer (PE, herein “Engineer” for Section 06 91 00 only), registered in the state of Michigan responsible for the structural design and submission of stamped drawings and calculations.
- B. At minimum, the design live load shall comply with:
 - a. Decking and landings: 60 psf
 - b. Guardrail load: 50 plf distributed or 200 lb. concentrated load, any direction.
 - c. Components must be detailed to transfer forces through posts and connections to supporting framing.
- C. All other loads per Michigan Building Code.
- D. Design foundations at address site-specific geotechnical conditions.
- E. All connections and fasteners exposed to weather shall be hot-dipped galvanized or stainless steel.

I.03 SUBMITTALS

- A. Shop drawings:
 - a. Plans, sections, details, and elevations of all components.
 - b. Foundation and anchorage design details.
- B. Calculations:
 - a. Structural design computations stamped by PE.

- C. Product data:
 - a. Lumber species and grades.
 - b. Preservative treatments.
 - c. Fasteners and connectors.
 - d. Guardrail/handrail components.
 - e. Decking material.
 - f. Railing/guardrail finishes.
- D. Mock-up:
 - a. Provide a full-size section of deck and guardrail, minimum 8-feet long, showing all materials, finishers, and connections for approval by Owner and Professional.
 - b. Mock-up may be incorporated into final structure if approved.

I.04 QUALITY ASSURANCE

- A. Contractor qualifications: Minimum of five (5) years of experience constructing similar systems.
- B. Engineer qualifications: Licensed PE in the state of Michigan with a minimum of (5) years of experience designing similar systems.
- C. Review project schedule, submittals, mock-ups, testing, inspection, and protection procedures.
- D. For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":
 - a. Dimension lumber framing.
 - b. Laminated veneer lumber.
 - c. Prefabricated wood I-joists.
 - d. Rim boards.
 - e. Miscellaneous lumber.

I.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials dry, undamaged, and with manufacturer's labels intact.
- B. Store off the ground, covered, and ventilated to prevent moisture accumulation.

PART 2 - PRODUCTS

2.01 WOOD MATERIALS

- A. Structural timber framing:
 - a. Species: Southern Pine No. 2 grade or better.
 - b. Pressure treated to AWPA UC4B standards, retention level for ground contact use.
 - c. Moisture content: less than or equal to 19% at time of fabrication.
- B. Decking:
 - a. Provide decking suitable for high-traffic, exterior use, capable of resisting weather, moisture, and UV degradation.
 - b. Decking options (select based on approval of Owner and Professional):
 - i. Pressure-treated Southern Pine, No. 1 grade or better, nominal 2x6 boards installed perpendicular or at an angle to joists.

- ii. Wood-plastic composite decking, meeting applicable ASTM and Michigan Building Code requirements for exterior composite materials.
 - c. Approved products must demonstrate a minimum 25-year warranty against material defects.
 - d. Colors and textures of composite decking to be approved by the Owner and Professional prior to ordering.
 - e. Minimum decking thickness: 1-1/2 inches for wood; manufacturer's standard for composites, subject to approval. It shall be the responsibility of the Contractor to ensure design deck elevation is at grade suitable for pedestrian use, all applicable code, regulations, and ordinances considered.
- C. Stair treads:
- a. To match decking materials, unless otherwise noted.
 - b. Provide solid 2x12 Southern Pine treads for wood options, or composite equivalents as approved.
 - c. Treads must provide a slip-resistant surface and be suitable for exterior applications on steep grades.

2.02 FASTENERS AND HARDWARE

- A. General requirements:
- a. Provide fasteners and hardware of size, type, material, and finish as indicated and required for the structural integrity of the work.
 - b. Where rough carpentry is exposed to weather, in ground contact, pressure-presentative treated, or located in areas of high relative humidity, provide fasteners and hardware manufactured from Type 304 or 316 stainless steel, hot-dipped galvanized, or other corrosion resistance method per manufacturer's recommendations, subject to review by Owner and Professional.
- B. Power-driven fasteners:
- a. Provide power-driven fasteners complying with ICC-ES ESR-1539 (formerly NES NER-272).
 - b. Fasteners shall be suitable for use in structural applications, as indicated, and meet manufacturer's published load values for wood connections.
- C. Bolts, nuts, and washers:
- a. Bolts: steel bolts conforming to ASTM A307, Grade A for general applications. Use ASTM A325 where higher strength is required, as indicated by Engineer.
 - b. Nuts: hex nuts conforming to ASTM F844, unless otherwise indicated by Engineer.
 - c. All field-drilled holes shall be clean, and bolts tightened to snug-tight condition, or as otherwise specified by Engineer.
- D. Other hardware:
- a. Threaded Rods: ASTM F1554, Grade 36 or better, hot-dipped galvanized or stainless steel.
 - b. Post Bases, Hangers, and Connectors: hot-dip galvanized per ASTM A123/A153 or stainless steel per project requirements.
 - c. Coatings: where galvanized fasteners are field cut, touch-up with zinc rich paint meeting ASTM A780.

2.03 GUARDRAILS AND HANDRAILS

- A. Timber guardrails:
- a. Posts:

- i. Minimum nominal 4x4 pressure-treated Southern Pine No. 2 or better.
 - ii. Posts should be installed plumb and anchored securely to withstand lateral and vertical loads in compliance with Michigan Building Code §1607.9.
 - iii. Post spacing shall not exceed horizontal spacing as specified by Engineer.
 - b. Top rails:
 - i. Minimum nominal 2x6 pressure-treated Southern Pine No. 2 or better.
 - ii. Installed level, with securely fastened connections to each post.
 - c. Intermediate rails:
 - i. Minimum nominal 2x4 members between posts, installed horizontally.
 - d. Balusters/infill:
 - i. Provide intermediate members or solid panels that prevent passage of a 4-inch-diameter sphere, in accordance with Michigan Building Code §1015.4.
 - ii. Baluster spacing not to exceed 3-7/8 inches clear between members.
 - iii. Balusters shall be minimum nominal 2x2, pressure-treated for durability and installed plumb.
 - e. Finish:
 - i. Timber members shall be smooth-sanded to prevent splinters.
 - ii. All cuts and drilled holes shall be field-treated with an approved preservative.
- B. Handrails:
 - a. Provide handrails at stairs as required by Michigan Building Code and/or local ordinance.
 - b. Code compliance:
 - i. Comply with Michigan Building Code §1014.
 - ii. Install on both sides of staircase.
 - c. Dimensions:
 - i. Gripping surface shall be continuous, smooth, and uninterrupted along the entire length of the stair flight.
 - ii. Circular cross-section with a diameter of 1-1/4 to 2 inches, or equivalent graspable shape per code.
 - iii. Minimum 1-1/2 inches clear space between handrail and adjacent wall or structure.
 - d. Returns and ends:
 - i. Handrails shall return smoothly to posts, walls, or the walking surface to prevent snagging per code.
 - ii. Ends shall be closed or returned.
 - e. Mounting height shall be 34 to 38 inches above stair tread nosings. Height shall be consistent along entire length of stair flight.
 - f. Materials and finish options:
 - i. Stainless Steel: Type 304, satin brushed finish.
 - ii. Powder-coated steel or aluminum: comply with applicable code and standards.

2.04 FOUNDATIONS

- A. General requirements:
 - a. The Contractor shall provide engineered foundation systems capable of supporting the stair and deck structure under all applied loads and site conditions, including slope, frost, and soil variability.
 - b. Foundations shall part of the scope of the contractor's Engineer (Michigan PE).
 - c. Foundation type shall be one of the following: helical piles or cast-in-place concrete piers or footings.

- B. Helical piles:
 - a. Helical pile foundations shall comply with applicable provisions of the MDOT Standard Specifications for Construction.
 - b. All helical pile components shall be Hot-Dip Galvanized (HDG) in accordance with ASTM A123.
 - c. Minimum shaft and helix sizes, embedment depth, torque criteria, and termination conditions shall be as required by the manufacturer and EOR.
 - d. Installation torque and pile logs shall be submitted for review.
 - e. Helical pile caps or adapters shall be designed to transfer loads to the superstructure without field welding unless approved.
- C. Concrete foundations:
 - a. All cast-in-place concrete foundations shall comply with applicable provisions of the MDOT Standard Specifications for Construction.
 - b. Concrete shall be Class A (minimum 3,000 psi unless otherwise shown on drawings).
 - c. Reinforcement, formwork, curing, and placement shall follow MDOT and ACI 318 requirements.
 - d. All concrete foundations shall extend to a minimum depth of 42 inches below finished grade and satisfy frost depth requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify field conditions and elevations prior to starting work.
- B. Confirm no conflicts exist between structure location and utilities.

3.02 INSTALLATION

- A. Install foundation systems per shop drawings and geotechnical report, per Engineer direction.
- B. Erect framing true to line, level, and plumb.
- C. Install decking with uniform gaps of 1/8 inch between boards, unless otherwise directed by manufacturer and Engineer.
- D. Pre-drill for all fasteners within 2 inches of ends to prevent splitting.
- E. Guardrails and handrails installed per code and manufacturer's requirements.
- F. Stagger joints in decking and stair treads for strength and aesthetics.

3.03 MOCK-UP

- A. Construct mock-up of staircase section with railing for review.
- B. Demonstrate materials, workmanship, and finishes.
- C. Modify as necessary until approval; once accepted, it becomes standard of quality.
- D. Protect approved mock-up during construction or reconstruct if damaged.

3.04 FIELD QUALITY CONTROL

- A. Perform inspection during installation as directed by Engineer, Owner, and/or Professional.
- B. Verify footing locations, pile embedments, and hardware installations.
- C. Provide test reports on pile and/or helical installations (if applicable).
- D. Final walk-through to confirm punch list items complete.

3.05 CLEANING AND PROTECTION

- A. Clean debris, remove construction waste from site.
- B. Protect work from damage until substantial completion.
- C. Provide temporary barriers as necessary, subject to Owner approval.

PART 4 – METHOD OF MEASUREMENT

4.01 GENERAL

- A. The work associated with Exterior Timber Staircase and Deck Assemblies will be measured as a single LUMP SUM unit, complete in place and accepted by the Engineer, Owner, and Professional.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the Owner, and Professional for approval of entire system.

PART 5 – BASIS OF PAYMENT

5.01 GENERAL

- A. Payment for the Timber Stair and Deck System (Design-Build) will be made on a LUMP SUM basis as stated in the Bid Schedule.
- B. The LUMP SUM price shall include full compensation for:
 - a. Professional engineering design services, include PE-stamped drawings and calculations.
 - b. Permitting and regulatory approvals, as required.
 - c. Mobilization and demobilization.
 - d. Site preparation, major clearing will be completed by site demolition contractor.
 - e. Excavation and grading.
 - f. Foundations, piles, or footings.
 - g. Structural framing, decking, stairs, and landings.
 - h. Guardrails, handrails, and any required safety systems.
 - i. All hardware, fasteners, connectors, and coatings.
 - j. Erosion control, drainage measures, and restoration of disturbed areas.
 - k. Inspections, testing, and quality assurance.
 - l. Final cleanup and site restoration.
 - m. As-built drawings and warranties, as required.
- C. Progress payments may be made in accordance with the following suggested milestones, or as otherwise agreed upon in the Contract.
 - a. Completion and acceptance of PE-stamped design documents: 15%
 - b. Completion of foundations (piles, footings, or helicals): 30%
 - c. Completion of structural framing and decking: 25%
 - d. Installation of guardrails, handrails, and remaining components: 20%
 - e. Final acceptance, punch list completion, and submittal of as-built drawings: 10%
- D. A final payment of the remaining balance will be made after:
 - a. Substantial completion and final inspection by the Engineer.
 - b. Substantial completion and final inspection by the Owner and Professional.

- c. Submission and acceptance of all closeout documentation, including As-Built drawings and warranties.
- d. Completion of all punch list items.

5.02 BASIS OF PAYMENT

A. Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
069100.01	TIMBER STAIRCASE	Lump Sum

END OF SECTION

EXTERIOR TIMBER BOARDWALK ASSEMBLIESSECTION 31 00 40PART I - GENERAL

I.01 DESCRIPTION

- A. This Section includes the fabrication and installation of an outdoor timber boardwalk, as laid out in the bid drawings.
- B. The Contractor shall provide all labor, materials, equipment, tools, supervision, and incidentals required for the installation of the system.
- C. Work includes, but is not limited to:
 - a. Foundations, including piles.
 - b. Timber framing
 - c. Timber or composite decking.
 - d. Guardrails and handrails.
 - e. Mock-up for approval.
 - f. Drainage and erosion control measures as required.
- D. Related sections:
 - a. Section 06 90 00, Timber Carpentry
 - b. Section 31 62 29, Driven Timber Piles

I.02 QUALITY ASSURANCE

- A. Except as noted, work shall conform to the following codes, specifications, and standards:
 - a. Michigan Building Code, 2021
 - b. American Society of Civil Engineers Structural Engineering Institute *Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE/SEI 7)*, 2016
 - c. American Wood Council (AWC): *National Design Speciation with Supplement (NDS)*, 2018, and *Special Design Provisions for Wind and Seismic (SDPWS)*, 2021
 - d. American Institute of Steel Construction (AISC): *Specification for Structural Steel Buildings*, 2016
 - e. American Society for Testing and Materials (ASTM)
 - f. American Welding Society (AWS)
 - g. MDOT Standard Specifications
 - h. 2010 ADA Standards
 - i. Others, as prescribed by Authority Having Jurisdiction (AHJ)
 - j. All welding shall be in accordance with the ANSI/AWS standards and shall be performed by experienced operators. All exposed surfaces and their welded joints shall be smooth and free of sharp or jagged edges.
 - k. Finished elevation of boardwalk and entrance intersections with the existing site elements shall be flush with less than a 1/2" gap between them.
 - l. Decking surface shall be protected during construction; surface shall be clean and stain free upon completion.

I.03 SUBMITTALS

- A. General —The bidder shall provide the submittals electronically for Professional’s evaluation and approval prior to fabrication. These submittals shall include:
- a. Shop Drawings—Prior to ordering and installation, the Contractor shall submit a complete set of manufacturer’s shop drawings including a complete and dimensioned layout drawing, fabrication drawing showing cross sections, attachments, cleat locations, bracing, connections, piling locations, utility penetrations, and any other necessary information for adequate product analysis of the fixed piers and their components.
 - b. Certifications and Cut Sheets:
 - i. Timber Certification: Contractor shall be responsible for providing evidence that all timber material is in accordance with the applicable grades and specifications.
 - ii. Metal Products Certification: Contractor shall provide notarized certification of all steel materials utilized in the system. This certification must attest to the compliance of all structural members, steel components, fasteners, welds, and piling with appropriate ASTM Reference Standards.
 - iii. Hardware: Provide cut sheets/information on all proposed hardware including size & finish.
 - iv. Welding Certification: Provide AWS certifications for welders performing the work for applicable welding types.
 - v. Warranty Certification: Manufacturers of products to be incorporated into the piers shall certify the warranty for their respective products as shown in the plans, shop drawings and included in this work.

I.04 WARRANTY

- A. Materials and workmanship:
- a. The Contractor shall warrant to the Director’s Representative that the materials and workmanship related to the production and installation of the platform will be free from defects under normal use and service for a period of five (5) years from the date of installation.
 - b. The Contractor will repair or replace, without cost to the Director’s Representative, any part, assembly, or portion thereof, which shall be determined to be defective.
- B. Decking:
- a. The Decking Supplier shall warranty the decking material against defects (splitting, crooking, cupping, bowing, twisting, or warping, etc.) due to materials for a non-prorated period of thirty (30) years. The Contractor shall warranty their workmanship, provided recommended maintenance schedules and procedures are followed, for a period of five (5) years.
 - b. During this decking material warranty period, deck boards exhibiting defects in excess of the following limits shall be replaced by the Contractor at no cost to the Owner:
 - i. Splits/End Checks: 1 inch max.
 - ii. Vertical Deflection (Cupping or Twisting): 1/4 inch
 - iii. This measurement shall be made by placing a 24 inch straight edge perpendicular to the length of the board. The level shall be made to rest on the highest point of the board and shimmed to read level. Vertical deflection shall be measured as the difference between the bottom edge of the straight edge and the board surface (turning not permitted).
 - iv. Presence of knotholes greater than 3/8 inch diameter, whether the hole extends

- completely through the board or not.
- v. Waning causing a gap larger than 3/8 inch between boards.
- C. Third Party Manufacturers: Manufacturers of products and materials to be incorporated by the Contractor shall certify the warranty for their respective products as shown in the plans, shop drawings and included in the work.
- D. Effective Date of Warranty: The effective date of the warranty shall be the date of acceptance by the Professional.
- E. Mock-up:
 - a. Provide a full-size section of deck and guardrail, minimum 8-feet long, showing all materials, finishers, and connections for approval by Owner and Professional.
 - b. Mock-up may be incorporated into final structure if approved.

I.05 QUALITY ASSURANCE

- A. Contractor qualifications: Minimum of five (5) years of experience constructing similar systems.
- B. Review project schedule, submittals, mock-ups, testing, inspection, and protection procedures.
- C. For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":
 - a. Dimension lumber framing.
 - b. Laminated veneer lumber.
 - c. Prefabricated wood I-joists.
 - d. Rim boards.

I.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials dry, undamaged, and with manufacturer's labels intact.
- B. Store off the ground, covered, and ventilated to prevent moisture accumulation.

PART 2 - PRODUCTS

2.01 WOOD MATERIALS

- A. Steel members and shall be one piece each, continuous and unused beams. Timber joists shall be unused, nominally sized sawn lumber.
- B. Beams and joists shall be the sections specified at minimum. Dock frame corners to be miter cut with full perimeter welds, topside welds to be smoothed to allow for proper decking attachment to adjacent nailer. Beams shall be constructed from A992 steel and have a minimum yield strength of 50 ksi.
- C. Timber materials shall be as follows:
 - a. Decking to be full length 2x6 Kebony Clear RAP Boardwalk Decking (38x140 mm) or approved equal. Decking shall be provided from FSC certified Radiata Pine, modified with a bio-based liquid. Decking shall include a 30-year non-prorated commercial warranty transferable to Owner, at minimum. Decking shall have a minimum density of 670 Kg/m³ at 12% moisture content. Decking shall have a Brinell hardness of 4.2 at minimum. Waste handling of decking shall be that of ordinary untreated wood.
 - b. Timber Superstructure Elements: Nominal sizes as shown in drawings, No. 2 Grade,

Treated Southern Pine Lumber. Material shall be straight and in good condition when installed. Treatment shall be for ground contact applications in accordance w/ AWPA Use Category UC4A at minimum.

2.02 FASTENERS AND HARDWARE

- A. General requirements:
 - a. Provide fasteners and hardware of size, type, material, and finish as indicated and required for the structural integrity of the work.
- B. Power-driven fasteners:
 - a. Provide power-driven fasteners complying with ICC-ES ESR-1539 (formerly NES NER-272).
 - b. Fasteners shall be suitable for use in structural applications, as indicated, and meet manufacturer's published load values for wood connections.
- C. Bolts, nuts, and washers:
 - a. Bolts: steel bolts conforming to ASTM A307, Grade A for general applications. Use ASTM A325 where higher strength is required, as indicated by drawings.
 - b. Nuts: hex nuts conforming to ASTM F844, unless otherwise indicated by drawings.
 - c. Where bolts are exposed to weather, ground contact, or pressure-treated wood, provide Type 304 stainless steel bolts, nuts, and washers, unless otherwise indicated by drawings.
 - d. All field-drilled holes shall be clean, and bolts tightened to snug-tight condition, or as otherwise specified by Engineer.
- D. Other hardware:
 - a. Threaded Rods: ASTM F1554, Grade 36 or better, hot-dipped galvanized or stainless steel, unless otherwise indicated by drawings.
 - b. Post Bases, Hangers, and Connectors: hot-dip galvanized per ASTM A123/A153 or stainless steel per drawings.
 - c. Coatings: where galvanized fasteners are field cut, touch-up with zinc rich paint meeting ASTM A780.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify field conditions and elevations prior to starting work.
- B. Confirm no conflicts exist between structure location and utilities.

3.02 INSTALLATION

- A. Install foundation systems per drawings and geotechnical report.
- B. Erect framing true to line, level, and plumb.
- C. Install decking with uniform gaps of 1/8 inch between boards, unless otherwise directed by manufacturer and/or Professional.
- D. Pre-drill for all fasteners within 2 inches of ends to prevent splitting.
- E. Guardrails and handrails installed per code.
- F. Stagger joints in decking and stair treads for strength and aesthetics.
- G. Corners of steel angle beams shall be mitered/smoothed to reduce sharp corners that could damage adjacent vessels.

- H. Joists shall have parallel upper edges at the same elevation to ensure level decking. Joists may be notched to be notched to accommodate grade changes where ramping of elevation is indicated on drawings. All notching to be in accordance to AWC NDS requirements. Notches to be as small as needed for clearance and confirmed with Professional prior to execution.
- I. Elevation of decking surface shall be as indicated in the contract drawings. Any gaps between existing elements and decking shall be less than ½ inch. Contractor shall install landward most deck boards in the field to ensure proper gaps.

3.03 MOCK-UP

- A. Construct mock-up of staircase section with railing for review.
- B. Demonstrate materials, workmanship, and finishes.
- C. Modify as necessary until approval; once accepted, it becomes standard of quality.
- D. Protect approved mock-up during construction or reconstruct if damaged.

3.04 FIELD QUALITY CONTROL

- A. Perform inspection during installation as directed by Engineer, Owner, and/or Professional.
- B. Verify footing locations, pile embedments, and hardware installations.
- C. Provide test reports on pile and/or helical installations (if applicable).
- D. Final walk-through to confirm punch list items complete.

3.05 CLEANING AND PROTECTION

- A. Clean debris, remove construction waste from site.
- B. Protect work from damage until substantial completion.
- C. Provide temporary barriers as necessary, subject to Owner approval.

PART 4 – METHOD OF MEASUREMENT

4.01 GENERAL

- A. The work associated with Exterior Boardwalk Assemblies will be measured as a single LUMP SUM unit, complete in place and accepted by the Engineer, Owner, and Professional.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the Owner, and Professional for approval of entire system.

PART 5 – BASIS OF PAYMENT

5.01 GENERAL

- A. Payment for the Exterior Timber Boardwalk Assemblies will be made on a LUMP SUM basis as stated in the Bid Schedule.
- B. The LUMP SUM price shall include full compensation for:
 - a. Permitting and regulatory approvals beyond those already obtained by the Professional, including but not limited to any necessary trade permits, construction-related authorizations, and agency notifications required for the execution of the work.
 - b. Mobilization and demobilization.

- c. Site preparation, major clearing will be completed by site demolition contractor.
 - d. Excavation and grading.
 - e. Pile driving.
 - f. Structural framing.
 - g. Guardrails and handrails.
 - h. All hardware, fasteners, connectors, and coatings.
 - i. Erosion control, drainage measures, and restoration of disturbed areas.
 - j. Inspections, testing, and quality assurance.
 - k. Final cleanup and site restoration.
 - l. As-built drawings and warranties, as required.
- C. Progress payments may be made in accordance with the following suggested milestones, or as otherwise agreed upon in the Contract.
- a. Mobilization and Pre-Construction Approvals: 10%
 - b. Site Preparation and Initial Earthwork: 10%
 - c. Pile Installation: 25%
 - d. Completion of structural framing: 20%
 - e. Installation of decking, guardrails, handrails, and remaining components: 20%
 - f. Erosion Control, Restoration, and final cleanup: 5%
 - g. Final acceptance, punch list completion, and submittal of warranty documents: 10%
- D. A final payment of the remaining balance will be made after:
- a. Substantial completion and final inspection by the Owner and Professional.
 - b. Submission and acceptance of all closeout documentation, including As-Built drawings and warranties.
 - c. Completion of all punch list items.

5.01 BASIS OF PAYMENT

A. Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
069200.01	TIMBER BOARDWALK, COMPLETE	LUMP SUM

PART I - GENERAL**I.01 DESCRIPTION**

- A. RELATED REQUIREMENTS: Review the General Contract Conditions and Division One specifications.
- B. WORK INCLUDED: Provide the following site and park furnishings complete as shown and as specified.
 - 1. Bench, New
 - 2. Bench, Relocated
 - 3. Swing Bench
 - 4. Picnic Table, Fixed
 - 5. Picnic Table, Free Standing
 - 6. Litter Receptacle
 - 7. Grill
 - 8. Ash Urn
 - 9. Bike Rack
 - 10. Dog Bag Dispenser
 - 11. Dumpster Enclosure
 - 12. Wheel Stop
 - 13. ADA Parking Sign and Post
 - 14. Regulatory Signs
 - 15. Security Bollard
 - 16. RV Pedestal
 - 17. Bollard Light
 - 18. Bollard Light w/ 120V Power
 - 19. Flagpole, Uplight
 - 20. Play Zone Trees
 - 21. Play Zone EWF Fall Surface
 - 22. Play Zone Concrete Curb
- C. RELATED WORK IN OTHER SECTIONS:

1. Section 03 30 00 Cast in Place Concrete
2. Section 31 00 00 Topsoil
3. Section 33 15 00 Site Electrical

I.02 QUALITY ASSURANCE

- A. APPLICABLE STANDARDS: Apply the current or latest editions of the standards described below:
 - ACI - American Concrete Institute Manual for Concrete Practice.
 - ASTM - American Society for Testing and Materials
- B. COMPATIBILITY WITH ADJACENT MATERIALS: Verify that all site furnishing materials are compatible with adjacent materials, and that their installation shall not adversely affect either the site furnishings or the adjacent materials.
- C. Shop assembly: Preassemble in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinate installation.
- D. Engineered Wood Fiber Mulch must meet or exceed the **ASTM F1292** standard for impact attenuation.

I.03 SUBMITTALS

- A. Submit manufacturer's product literature with powdercoat color and finish samples along with dimensioned detail drawings and installation recommendations for:
 1. Bench, New
 2. Bench, Relocated
 3. Swing Bench
 4. Picnic Table, Fixed
 5. Picnic Table, Free Standing
 6. Litter Receptacle
 7. Grill
 8. Ash Urn
 9. Bike Rack
 10. Dog Bag Dispenser
 11. Dumpster Enclosure
 12. Wheel Stop

13. ADA Parking Sign and Post
14. Regulatory Sign
15. Security Bollard
16. RV Pedestal
17. Bollard Light
18. Bollard Light w/ 120V Power
19. Uplight
20. Play Zone Trees
21. Play Zone EWF Fall Surface
22. Play Zone Concrete Curb

I.04 SHOP DRAWINGS

- A. Submit shop drawings with all materials, welds, fasteners, and dimensions labeled for:

- I. SITE FURNITURE LAYOUT

I.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. LABELING: Furnish standard products in unopened manufacturer's original containers bearing original labels showing quantity, description and name of manufacturer.
- B. DELIVERY: Deliver and unload at the site on pallets and bound in such a manner that no damage occurs to the product.
- C. STORAGE: Store products in a manner that will preclude all damages. Damaged materials will be rejected. Remove all damaged materials from the job site immediately and replace at no cost to Owner.
- D. HANDLING: Furnish suitable equipment to locate all site furnishing materials carefully and efficiently. Lift materials using lifting inserts provided by manufacturer where applicable.
- E. METAL MATERIAL AND CONSTRUCTION METHODS:
 - I. Workmanship and finish shall be equal to the best practice of modern shops for each item of work. Exposed surfaces shall have smooth finish and sharp, well-defined lines and arises. Sections shall be well formed to shape and size with sharp lines and angles; curved work shall be sprung evenly to curves. Castings shall have sharp corners and edges, and shall be clean, smooth, and true to pattern. Welding shall be in accordance with the Welding Code of the American Welding Society. All welding, except as otherwise indicated, shall extend the entire length of joints. All welded face joints shall be ground flush and smooth. All welds shall be watertight. Ornamental metalwork shall be cut, drilled, countersunk, and tapped as required for the attachment of other work where shown on the Drawings or when instructions for such work are given on the approved shop drawings. Ornamental metalwork to be built in with concrete or masonry shall be of

the form required for anchorage or shall be provided with suitable anchors or expansion shields.

2. Steel fabrication shall be accomplished using the highest standards of workmanship. Individual steel pieces shall be sawcut and carefully fit together. All connections shall be full welded and ground flush and smooth. All fabricated steel items shall be fine sanded throughout to produce a high standard of surface smoothness. All surfaces and connections shall be without visible grinding marks, surface differentiation or variation.
3. All material that is specified to be galvanized shall be hot-dipped galvanized after fabrication, in accordance with ASTM Standard A123, A153, or A386, as applicable. The galvanizer shall provide a notarized statement indicating compliance with the ASTM Standard.
4. Galvanized surfaces damaged by welding or other causes shall be wire brushed to remove all loose or cracked zinc coating and re-galvanized with a 95 percent zinc cold galvanizing coating prior to finishing.

PART 2 - PRODUCTS

2.01 POLYESTER POWDER COATING - Items designated in the finish schedule for polyester powder coating will be finished as follows:

A. Painting

Paint will be shop-applied to the steel surface within 24 hours of galvanizing in such a manner that the paint is permanently bonded to the galvanized surface. The paint will be a TGIC - Polyester Powder Coating, as manufactured by Fuller O'Brien Corp. or approved equal, applied to the steel via the Powder Coating Process, including application of powder and baking per manufacturer's recommendations. The Powder Coat will be applied at a film thickness of 0.04 mm to 0.06 mm. Adhesion will be per ASTM D-3359-B, Pencil Hardness (H-2H) per ASTM D-3363, Flexibility per ASTM D-522 (Mod), Impact Resistance per ASTM D-2794 (Mod), Abrasion Resistance per ASTM D4060 (Mod), Salt Spray Resistance per ASTM B-117, and Humidity Resistance per ASTM D-2247..

2.02 SEALANTS

- A. Sealants for application on Site Furnishings as specified shall be polyurethane-based, one component, elastomeric sealants complying with Fed. Spec. TT-S-00230C, Class A Type 1 for horizontal use and Type 2 for vertical use. Color to be selected by Engineer. Sealants shall be self-leveling pour grade type for horizontal use and non-sag, gun-grade type for vertical use. Color shall match adjacent masonry materials per approved samples.

2.03 ANCHOR BOLTS

- A. Anchor bolts, nuts, and washers to be placed in pre-drilled holes in concrete base for site furniture will be one-piece, pre-assembled, stainless steel bolt anchors for masonry with a

minimum pull out strength of 1000 lb. as manufactured by McMaster-Carr supply company Dayton, NJ (908) 329-3100 or approved equal manufacturer.

2.04 PREFABRICATED FURNISHINGS

- A. BENCH, NEW: as manufactured by DuMor, 138 Industrial Circle, Mifflintown, PA 17059. 800-598-4018. sales@dumor.com Or approved equivalent.
1. Model: 57-60PL. 6' Cast Bench, Recycled Plastic. Surface mount. 2 Armrests, either side, no center armrest.
 2. Color: Powercoat steel, Black
 3. Installation: Stainless Steel anchor bolts per approved shop drawing. Spot weld connection to prevent removal. Corrosion-resistant anchoring hardware supplies by others.
- B. BENCH, RELOCATED: Removed from existing site and stored by Village. Installation only, see Plans for locations. Mount per A, #3, above.
- C. SWING BENCH: as manufactured by Premier Polysteel. [305 Enterprise Drive, PO Box 77, Northwood, IA 50459](mailto:sales@premierpolysteel.com) 641-381-5183. sales@premierpolysteel.com Or approved equivalent.
1. Model: 6' Contour Memorial Swing, Laser Cut Steel
 2. Color: Powdercoat steel, Black
 3. Installation: Per Manufacturer recommendation.
- D. PICNIC TABLE, FIXED. as manufactured by DuMor, 138 Industrial Circle, Mifflintown, PA 17059. 800-598-4018. sales@dumor.com Or approved equivalent.
1. Model: 76-34PL, Recycled Plastic. 4 seats: QUANTITY 4.
Model: 76-33PL, Recycled Plastic. 3 seats: QUANTITY 2.
 2. Color: Powdercoat steel, Black.
 3. Installation: Per details.
- E. PICNIC TABLE, FREE-STANDING: as manufactured by DuMor, 138 Industrial Circle, Mifflintown, PA 17059. 800-598-4018. sales@dumor.com Or approved equivalent.
1. Model: 77-60PL, Recycled Plastic. 6'
 2. Color: Powdercoat steel, Black
 3. Installation: free-standing

- F. LITTER RECEPTACLE: as manufactured by DuMor, 138 Industrial Circle, Mifflintown, PA 17059. 800-598-4018. sales@dumor.com Or approved equivalent.
1. Model: 287-32SH, 32 gallons.
 2. Color: Powdercoat steel, Black
 3. Installation: Stainless Steel anchor bolts per approved shop drawing. Spot weld connection to prevent removal.
- G. GRILL: as manufactured by DuMor, 138 Industrial Circle, Mifflintown, PA 17059. 800-598-4018. sales@dumor.com Or approved equivalent.
1. Model: 21-00, embedded
 2. Color: Black
 3. Installation: Per details.
- H. ASH URN: as manufactured by Anova Furnishings. 1424 Talmage Ave, St. Louis, MO 63110. (800) 325-3047. sales@anovafurnishings.com. Or approved equivalent.
1. Model: Commercial Zone Smokers' Outpost Classico
 2. Color: Black
 3. Installation: free-standing
- I. BIKE RACK: as manufactured by DuMor, 138 Industrial Circle, Mifflintown, PA 17059. 800-598-4018. sales@dumor.com Or approved equivalent.
1. Model: Bike Rack 83 -00/S-I.
 2. Color: Powdercoat steel, Black
 3. Installation: Per details.
- J. DOG BAG DISPENSER: as manufactured by Anova Furnishings. 1424 Talmage Ave, St. Louis, MO 63110. (800) 325-3047. sales@anovafurnishings.com. Or approved equivalent.
1. Model: Dog Waste Station with Square Steel Can and ONEpul Bag System
 2. Color: Black
 3. Installation: Install with footings per local code.
- K. DUMPSTER ENCLOSURE: The work associated with this item is noted on the plans.

- L. Wheel STOP: Concrete Wheel Stops shall be furnished and installed in the noted locations on the plans and shall comply with local standards
- M. ADA Parking Sign and Post: Materials to match typical Village of Lexington signage. Install per local code and MDOT standard.
- N. Regulatory Signs: Any additional parking signs required, as determined by the Owner. Materials to match typical Village of Lexington signage. Install with footings per local code and MDOT standard.
- O. Bollard: as manufactured by Landscape Forms, Inc. 431 Lawndale Avenue, Kalamazoo, Michigan 49048. Toll Free (800) 521-2546.
 - 1. Model: "Annapolis Bollard", 6" nominal diameter. Surface Mount.
 - 2. Color: Black.
 - 3. Installation: Stainless Steel anchor bolts per approved shop drawing. Spot weld connection to prevent removal.
- P. RV Pedestal
 - 1. Model: See Sheet E1.1
 - 3. Installation: Mounting structure to be constructed with footings per Local Code.
- Q. Bollard Light
 - 1. Model: See Sheet E0.1
 - 2. Color: Black
 - 3. Installation: Per details sheet E0.1
- R. Bollard Light with 120V Power Connection
 - 1. Model: See Sheet E0.1
 - 2. Color: Black
 - 3. Installation: Per details sheet E0.1
- S. Flagpole, Uplight
 - 1. Model: See Sheet E0.1 (size to fit existing flagpoles, which will be relocated)
 - 2. Color: Silver
 - 3. Installation: Mounted to flagpole, per manufacturer instructions.

- T. Play Zone: Trees, Engineered Wood Fiber Mulch, Concrete Curb: see notes in drawings, Sheet LS-5.08.

2.05 MAINTENANCE SUPPLIES

- A. Touch Up Paint for Benches, Litter Receptacle :
 - 1. "Quick-Dry" touch up paint provided by manufacturer.
 - 2. One quart of matching paint provided by each manufacturer as well as additional rust inhibitors or cleaners deemed necessary. Include manufacturer's instructions for repair of damages. Furniture items damaged during construction and repaired by the contractor will not be accepted.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. All Site Furnishings shall be fabricated and fastened in accordance with Construction Drawings and/or approved Shop Drawings. All Site Furnishings shall be installed in a level, plumb condition, true to the lines and grades shown on plans.
- B. The Contractor shall be responsible for timing the delivery of all items so as to minimize on-site storage time prior to installation. All stored materials and items must be protected from weather, careless handling and vandalism.
- C. Shim all bolt connections with stainless steel shims as necessary and secure bolts. Exposed bolts shall be fastened with an approved semi-permanent adhesive and/or spot welded in place to protect against vandalism.
- D. Contractor shall handle, pack, and ship in such a manner as to minimize damage to the finish. Upon arrival at job site it is the Contractor's responsibility to take equal precautions. Since some surface damage is inevitable, suitable touch-up material shall be readily available to repair any damage immediately.
- E. Non-shrink epoxy grout for site furnishings will be installed per manufacturer's recommendations and as shown on Drawings.
- F. Sealants for Site Furnishings shall be placed following the manufacturer's instructions and recommendations for the particular application. Place sealant from one side only to avoid trapping air. Work or flow sealant into place, filling all cavities. Finished sealant surface shall not be recessed and shall not allow the ponding of water. Color to match surrounding work and as approved by Owner's Representative.
- G. ACCEPTANCE: Do not install site furnishings prior to acceptance by Owner's Representative of area to receive such materials.

- H. LOCATIONS: Install all site furnishings per approved shop drawings, as directed and as shown on the Drawings.
- T. SPECIAL PRECAUTIONS: Guard against staining or damaging of existing pavements and plantings where site furnishings are to be installed.

3.02 ALL SITE FURNITURE

- A. Provide quantities as shown on Drawings and at locations shown on the drawings and as approved in the field.
- B. Install bench with seat level across the front.
- C. Install furniture so fixtures will not rock or move when tested by field inspector.

3.04 SITE FURNITURE FOUNDATIONS

- A. Foundation shall be cast-in-place and installed complete with required anchor bolts, and any necessary fittings, conduit, ground rod (for electrical work).
- B. Foundation shall be cast-in-place against undisturbed soil with anchor bolts, conduit, ground rod and all fittings held in place by a template.
- C. Anchor bolts are to extend 3 inches above top of foundation.
- D. Conduit is to extend 9 inches above top of foundation.
- E. Ground rod is to be bent into and extend 4 inches above top of foundation.
- F. Earth anchors may be used for preparation of excavation for casting foundation against undisturbed soil.
- G. Use of sonotubes for forming cast-in-place foundations will not be allowed, unless specifically approved for use by the Engineer.

3.04 LIGHT BOLLARDS

- A. Furnishing and installing either light pole or bollard, interior conduit and fittings
- B. Picking up and installing anchor bolts, nuts and washers
- C. Leveling shims
- D. Any required cutting
- E. Connecting conduit to foundation
- F. Furnishing and installing ballast and fixture per the drawing

3.05 CLEAN-UP

- A. Keep all areas of work clean, neat and orderly at all times.
- G. Clean up and remove all debris from the entire work area to satisfaction of Owner's Representative prior to Final Acceptance.

PART 4 - METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. Site Furnishings will be measured as noted below.

PART 5 - BASIS OF PAYMENT

5.01 SITE FURNISHINGS

The basis of payment shall be as noted below for each of the site furnishings include all materials, labor, equipment, transportation, testing, and supervision necessary to complete the items identified herein, and any incidentals necessary for completion of the work specified herein and as shown on the Contract drawings or as directed by the Engineer.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
I29300.01	BENCH, NEW	Each
I29300.02	BENCH, RELOCATED	Each
I29300.03	SWING BENCH	Each
I29300.04	PICNIC TABLE, FIXED	Each
I29300.05	PICNIC TABLE, FREE STANDING	Each
I29300.06	LITTER RECEPTACLE	Each
I29300.07	GRILL	Each
I29300.08	ASH URN	Each
I29300.09	BIKE RACK	Each
I29300.10	DOG BAG DISPENSER	Each
I29300.11	DUMPSTER ENCLOSURE	Lump Sum
I29300.12	WHEEL STOP	Each
I29300.13	ADA PARKING SIGN AND POST	Each

TIERNEY PARK

LEXINGTON, MICHIGAN

129300.14	REGULATORY SIGN	Each
129300.15	SECURITY BOLLARD	Each
129300.16	RV PEDESTAL	Each
129300.17	BOLLARD LIGHT	Each
129300.18	BOLLARD LIGHT W/ 120V POWER	Each
129300.19	FLAGPOLE, UPLIGHT	Each
129300.20	PLAY ZONE TREES	Cubic Yard
129300.21	PLAY ZONE EWF FALL SURFACE	Square Foot
129300.22	PLAY ZONE CONCRETE CURB	Linear Foot

END OF SECTION

PART I - GENERAL**I.01 DESCRIPTION**

- A. The work of this Section consists of all earthwork and related items as indicated on the Drawings and/or as specified herein and includes the following:
 - 1. Excavation, filling and grading
 - 2. Providing, placing and grading topsoil
 - 3. Topsoil Surface, Salv, 5"
- B. All work will also include the preservation from injury or defacement of all vegetation and objects designated to remain as shown on the Drawings or as directed by the Owner's Representative.

I.02 STANDARDS AND DEFINITIONS

- A. ASTM: American Society for Testing and Materials.
- B. AASHTO: American Association of State Highway and Transportation Officials.

I.03 RELATED WORK IN OTHER SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:
 - 1. Section 02 31 00 Soil Preparation and Fine Grading
 - 2. Section 31 22 13 Machine Grading Modified
 - 3. Section 31 25 00 Soil Erosion and Sedimentation Control
 - 4. Section 32 92 00 Seed, Fertilizer and Mulch

I.04 EXAMINATION OF SITE AND DOCUMENTS

- A. The Contractor shall inspect the site prior to beginning work and request clarification regarding the disposition of any conditions that are not shown on the Drawings.

I.05 SAMPLES AND SUBMITTALS

- A. Topsoil: Provide three 1 cubic foot samples of proposed topsoil for agricultural suitability analysis, each from a separate area of the soil source, for testing, analysis, and approval. The

Contractor shall deliver samples to testing laboratories and have the testing report sent directly to the Owner's Representative and pay all costs. Testing sample materials and areas at the source from which they were taken shall be clearly labeled with number 1, 2, and 3. Testing samples and reports will have the appropriate corresponding numbers printed on them. Reports shall include the following tests and recommendations.

- I. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System. A hydrometer shall be used to determine the percentage each of clay and silt.
2. Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 degrees F, plus or minus 9 degrees.
- B. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, extractable Aluminum, Soluble Salts, and acidity (pH) and buffer (pH).
- C. Tests, as specified, for gradation, organics, soil chemistry and pH shall be performed by a public extension service or a private testing laboratory approved by the Owner's Representative.
- D. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish particular lawns and planting objectives noted.
- E. All tests shall be performed in accordance with the current standards of the Association of Official Analytical Chemists.

I.06 PERMITS, CODES, AND SAFETY REQUIREMENTS

- A. Comply with all rules, regulations, laws and ordinances of the City and State, and all other authorities having jurisdiction over the project site. All labor, materials, equipment and services necessary to make the work comply with such requirements shall be provided by the Contractor.
- B. Comply with the provisions of the Manual for Accident Prevention in Construction of the Associated General Contractors of America, Inc., and the requirements of the Occupational Safety and Health Administration, United States Department of Labor.
- C. Ensure that the Owner's Representative has acquired all permits and licenses required to complete work specified herein and shown on the Drawings.
- D. Do not close or obstruct any street, sidewalk, or passageway without permission from the Owner's Representative.

I.07 LAYOUT AND GRADES

- A. Notify the Owner's Representative at least 48 hours before survey work is required so that survey can be complete in time for construction. Ensure that lines and grades have been established by the Owner's Representative's surveyor prior to beginning work.
- B. The words "finished grade" as used herein shall mean final grade elevations indicated on the Drawings. Project site areas shall be given a uniform slope between points for which finished grades are indicated or between such points and existing established grades except at the top and toe of slopes where curving, smooth and continuous slopes will be established.

I.08 PROTECTION OF EXISTING CONDITIONS

- A. All rules and regulations governing the respective utilities shall be observed during the execution of the work under this Section. All work shall be executed in such a manner as to prevent any damage to existing buildings, streets, curbs, paving, service utility lines, structures and adjoining property.
- B. Locate and mark underground utilities to remain in service before beginning work.
- C. Protect all existing utilities to remain during operations. Do not interrupt existing utilities except when authorized in writing by authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General

- 1. Fill materials shall conform to the following material descriptions. AASHTO T11, T27 and AASHTO M145 shall determine gradation requirements.

B. TOPSOIL

- 1. Topsoil for use as a planting medium for turf grass shall be only fertile, friable, well-drained soil typical of native topsoil of the west Michigan region. Topsoil shall be, a "Sandy Loam" determined by mechanical analysis and based on the "USDA Classification System". It shall be of uniform composition, without admixture of subsoil, free of stones, lumps, plants and their roots, debris and other extraneous materials. It shall be obtained from naturally well-drained areas which have never been stripped before and have a history of satisfactory vegetative growth of uniform quality.
- 2. Topsoil for use as dunegrass planting shall be 12" depth "clean" (no organics) sand.
- 3. Test soil as specified and combine additives as required by the testing agency and as approved by Landscape Architect prior to delivery to site.

2.02 SOIL ADDITIVES

- A. Sulphur for adjustment of topsoil pH shall be commercial or flour Sulphur, unadulterated, and shall be delivered in containers with the name of the manufacturer, material, analysis and net weight appearing on each container.
- B. Ground limestone for adjustment of topsoil pH shall contain not less than eighty-five percent of total carbonates. Forty percent will pass through 100-mesh sieve and ninety five percent will pass through a 20-mesh sieve. The Contractor shall be aware of topsoil pH and the amount of lime needed to adjust pH to specification in accordance with testing lab recommendations.
- C. Organic soil additives shall be natural humus, free from excessive amounts of zinc, low in wood content, free from hard lumps and in a shredded or granular form. According to the methods of testing of A.O.A.C., latest edition, the acidity range shall be approximately 5.5 pH to 7.6 pH and the organic matter shall be not less than 85%. The minimum water absorbing ability shall be 200% by weight on an oven-dry basis.
- D. Fine Sand
 - 1. Physical Properties (dry weight basis): at least 95 percent will pass a no. 20 sieve, and no more than 20 percent will pass a no. 200 sieve.
 - 2. Chemical Properties:
 - a. Salinity: The saturation extract conductivity shall not exceed 3.0 milliohms/cm @ 25 degrees C.
 - b. Boron: The concentration in the saturation extract shall not exceed 1.0 ppm.
 - c. Sodium: The sodium absorption ratio (SAR) as calculated from analysis of the saturation extract shall not exceed 6.0.
- E. Gypsum: Agricultural grade product containing 80% minimum calcium sulfate.
- F. Iron Sulfate (Ferric or Ferrous): Supplied by a commercial fertilizer supplier, containing 20% to 30% iron and 35% to 40% Sulfur.
- G. Sulfate of Potash: Agricultural grade containing 50% to 53% of water-soluble potash.
- H. Single Superphosphate: Commercial product containing 20% to 25% available phosphoric acid.
- I. Ammonium Sulfate: Commercial product containing approximately 21% ammonia.
- J. Ammonium Nitrate: Commercial product containing approximately 34% ammonia.
- K. Calcium Nitrate: Agricultural grade containing 15-1/2% nitrogen.
- L. Urea Formaldehyde: Granular commercial product containing 38% nitrogen.
- M. I.B.D.U. (Iso-Butyldiene Diurea): Commercial product containing 31% nitrogen.
- N. Iron Sequestrene: Geigy Iron Sequestrene 330 Fe.

- O. Bone meal shall be fine ground, steam-cooked, packinghouse bone with a minimum analysis of twenty three percent (23%) phosphoric acid and one percent (1.0%) of nitrogen.

PART 3 - EXECUTION

3.01 GRADES AND ELEVATIONS

- A. The Drawings indicate alignments, grade elevations and invert elevations. Establish the lines and grades in conformity with the Drawings. The Landscape Architect, however, will make such adjustments in the field as are found necessary in order to avoid interference with any special conditions encountered.
- B. Project areas shall be given uniform slopes between points for which finished grades are indicated or between such points and existing established grades. All lawns and planting areas shall slope at a minimum of 2%. Round the tops and toes of all slopes as directed by Owner's Representative. Notify Landscape Architect of any conditions are encountered that will not allow adequate surface slope and request direction before proceeding.
- C. Coordinate with the Owner's representative so that suitable grade stakes are located and maintained until finish grade is accepted. Maintain sufficient reference points at all times during construction to properly perform the contract installation.
- D. Base materials in areas to be paved shall be installed with the same surface slope as proposed finished grade.
- E. Contractor may reuse "clean sand" with no organic material in dune grass planting areas with prior Owner review and approval. Contractor may also reuse excavated "dirty sand" or poor topsoil as base material for berms with prior Owner review and approval. Contractor may also salvage and reuse topsoil on site if material meets specifications outlined in this Section 31 00 00 Topsoil.

3.02 CLEANUP

- A. At the end of all excavation, filling and grading operations and before acceptance of the work, the Contractor shall remove all debris, rubbish, etc., from the site. The premises shall be left clean and presentable to the Owner's satisfaction.

PART 4 - METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. The work associated with TOPSOIL, 4" will be measured by the Square Yard.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the owner for approval.

PART 5 - BASIS OF PAYMENT

5.01 PAYMENT

- A. The work associated with TOPSOIL, 4" shall be paid at the Square Yard price bid installed which includes materials, labor, equipment, transportation, and supervision necessary to complete the installation of items identified herein, and any incidentals necessary for completion of the specified herein as shown on the Contract drawings or as directed by the Engineer.

ITEM NO.	ITEM	PAY UNIT
310000.01	TOPSOIL, 4"	Square Yard

END OF SECTION

MACHINE GRADING MODIFIEDSECTION 31 22 13**PART I - GENERAL****1.01 DESCRIPTION**

- A. The work Machine Grading Modified shall consist of all excavation and embankment; the utilization of all suitable material in constructing the adjacent fills, and the furnishing and placing of borrow and subbase.
- B. The CONTRACTOR shall review the soil conditions and make themselves aware of the various types and thicknesses of the various soils. The water table should also be noted, and construction methods adjusted accordingly.

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. The work shall be performed by blade graders or other equipment for Longitudinal Hauling as required or by suitable equipment as deemed necessary by the CONTRACTOR to accommodate construction on this site and the native soils. Machine Grading, Modified shall apply to all sections of this project.
- B. Excess material shall be placed and compacted in areas designated by the LANDSCAPE ARCHITECT after vegetation and topsoil is removed.

PART 3 - EXECUTION**3.01 GENERAL**

- A. Machine Grading Modified shall include all necessary removal, scarifying, plowing, discing, moving, hauling, shaping and compacting the earth to develop the cross section and contours shown on the plans within the grading limits.
- B. The site shall be finished to grade with a blade grader or equivalent equipment. All intersections, approaches, entrances and driveways shall be graded as shown or as directed. If additional earth is required to complete the full section, the CONTRACTOR shall obtain the required class II material from borrow.
- C. Excess cut material if any, as well as the topsoil, shall be stored on site in an area designated by the OWNER. Excess cut material not needed for the desired cross sections shall be removed from the site.

- D. Contractor may reuse “clean sand” with no organic material in dune grass planting areas with prior Owner review and approval. Contractor may also reuse excavated “dirty sand” or poor topsoil as base material for berms with prior Owner review and approval. Contractor may also salvage and reuse topsoil on site if material meets specifications outlined in Section 31 00 00 Topsoil.
- E. All items included under Machine Grading Modified shall be constructed in accordance with standard MDOT specifications except that the method of placing and compacting embankments shall be by the 12-inch Layer Method Modified as follows.

12-inch Layer Method Modified

- 1. The provisions of Article 205.03-4b are amended as follows:
 - 2. Unit weight requirements are waived and density tests will be made if determined necessary by the ENGINEER.
 - 3. The operations of compacting shall be continued until the entire depth of each layer is compacted full width to produce a stable and well consolidated roadway foundation.
- F. All survey work to be performed by CONTRACTOR

PART 4 - METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. The work associated with MACHINE GRADING MODIFIED will be measured by the LUMP SUM.
- B. Prior to acceptance and final payment the Engineer shall observe site conditions with the owner for approval.

PART 5 - BASIS OF PAYMENT

5.01 PAYMENT

- A. The work associated with MACHINE GRADING MODIFIED shall be paid as a LUMP SUM for the proposed site improvements which includes materials, labor, equipment, transportation, survey control/layout and supervision necessary to complete the installation of items identified herein, and any incidentals necessary for completion of the specified herein as shown on the Contract drawings or as directed by the Engineer.

ITEM NO.	ITEM	PAY UNIT
312213.01	MACHINE GRADING MODIFIED	Lump Sum

END OF SECTION

PART I - GENERAL**I.01 SUMMARY**

- A. All work under this Contract must meet the storm water management requirements of the Project and comply with the applicable Soil Erosion and Sedimentation Control (SESC) rules and regulations (Soil Erosion and Sedimentation Control – 1994 PA 451, Part 91, as amended, MCL 324.9101 et seq.) and specific provisions and regulations for the same within the Contract Documents.
- B. Notwithstanding herein, the contractor shall adhere to all SESC regulations as required in the SESC permit.
- C. Related Work: Documents affecting work of this section included, but are not necessarily limited to: General conditions, Supplementary Conditions, and in Division I – Section 01565 of these Specifications.

I.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Use equipment adequate in size, capacity, and number to accomplish the work of this section in a timely manner.
- C. Codes and permits: As applicable for this project, the Contractor must secure and pay for all construction permits including Soil Erosion and Sedimentation Control Permit (Sanilac County). Construction work must comply with these permit stipulations. The Contractor must prepare and submit all necessary reports and formwork required by agencies.

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. Use SESC control devices as specified in MACDC SESC APA procedures manual.

2.02 WORK INCLUDED

- A. Identify required lines, levels, contours, and datum, as well as field locates known utilities locations.
- B. Notify Engineer of conflicts and attain removal or relocation instructions prior to continuing installation activities.

- C. Maintain and protect existing utilities to remain as well as protect adjacent structures and property, which may be damaged by executions of work and protect trees, shrubs, landscaping and lawn areas designated to remain.
- D. Construct soil erosion prevention and sedimentation control measures in accordance with the plans. Planned control measures shall be scheduled with construction operations to limit the area of any disturbed land to the shortest possible period of exposure. All earth changes shall be conducted so as to effectively reduce accelerated soil erosion and resulting sedimentation as well as remove all sediment from runoff water before it leaves the site.
- E. Inspect, maintain and repair temporary control measures until permanent control measures are implemented and maintain permanent control measures until final acceptance by Owner as well as install silt fences around all catch basin inlets, to be removed after final inspection of the project. The contractor shall maintain all SESC measures for the duration of the project.
- F. Work shall be executed by methods to minimize raising dust from construction operations.
- G. Trash, debris, or sediment shall not be deposited in tile or open drains.
- H. Trenches shall be immediately repaired which are located within the traveled surface or roadways.
- I. Construction areas shall be landscaped as soon as possible after work is complete.
- J. Implement measures to minimize dust as well as develop a dust plan that will be reviewed and approved by the Engineer/Owner.
- K. Adequate chloride application will be required monthly at a minimum on all travel routes. Wet application shall be required several times daily or as directed by the Engineer. All surfaces must be swept or vacuumed at end of each work day at a minimum and may be required more often at the direction of the Engineer.

The SESC plan shall include but not limited to the implementation of a combination of any or all of the following techniques as determined by the Engineer, wet suppression, vehicle speed reduction, surface cleaning, traffic control, windbreaks, good operating practices, and chloride application.

PART 3 - EXECUTION

3.01 SOIL EROSION AND SEDIMENTATION

- A. The Contractor and its subcontractors/suppliers must comply with all applicable Federal, State and local environmental laws, standards, orders or requirements including but not limited to the National Environmental Policy Act of 1969, as amended; Michigan Natural Resources and Environmental Policy Act, P.A. 451 of 1994, as amended; Clean Air Act, as amended; Clean Water Act as amended; Safe Drinking Water Act, as amended; Pollution Prevention Act, as amended; Resources Conservation and Recovery Act, as amended; National Historic Preservation Act, as amended; Energy Policy and Conservation Act and Energy Standards for Buildings Except Low-Rise Residential Buildings, ANIS/ASHRAE/IESNA Standard 90.1-1999.

1. Prior to the start of earthwork, the Contractor must submit a Soil Erosion and Sedimentation Control (SESC) Implementation Plan to the Engineer including the SESC permit if required. If not required, Contractor must provide evidence from governing body that permit is not required for proposed work.
 2. The Contractor must implement Soil Erosion and Sedimentation Control measures as required by the project's SESC plan and permit.
 3. The Contractor must install temporary Soil Erosion and Sedimentation Control measures prior to or upon commencement to earthwork activities.
 4. Construction operations must be conducted in such manner as to provide permanent and temporary Soil Erosion and Sedimentation Controls and to prevent damaging sedimentation of watercourses, streams or lakes. Further, the Contractor must conduct his work in a manner such that all soil, fuels, oils, bituminous materials, chemicals, sanitary sewage, and other harmful materials resulting from the construction of the project are confined within the project limits, properly disposed of, and prevented from entering watercourses, rivers, lakes, or entering onto or causing damage to adjoining or other properties. A schedule of Soil Erosion and Sedimentation Control activities must be submitted prior to any earth-change activity.
 5. Should any requirements for projecting against Soil Erosion and Sedimentation Control be neglected or not adequately followed, the Owner may, upon three days written notice, require the Contractor to immediately cease construction operations and to apply his/her entire efforts to meet the omitted requirements before proceeding further with the project. Should the Contractor, upon such written notice, neglect, refuse, or fail to adequately correct matters causing or contributing to uncontrolled Soil Erosion or Sedimentation Control, the Owner may and without prejudice to any other recourse, on written notice, immediately execute the required work in the most expedient manner or it may elect and deduct all related costs from the Contract amount. No extension of the completion date will be allowed relating to such defaulted work.
- B. The Contractor must maintain and inspect SESC measures throughout the course of the project. Recommend inspecting and maintaining Soil Erosion and Sedimentation Controls on a daily basis. At a minimum, the Contractor must inspect and maintain SESC measures once a week and after rain events. During any filling and grading operations where soil erosion and sedimentation is likely to be a problem, the Contractor's operation must be scheduled and performed such that required permanent soil stabilization can follow immediately thereafter if the project conditions permit; otherwise, temporary approved Soil Erosion and Sedimentation Control measures will be required between successive construction stages. Soil erosive or sediment producing area must have temporary Soil Erosion and Sedimentation Control measures installed before construction activities begin.
- C. Dust Control: The Contractor must control dust, both off and on site, from his/her operation in a manner approved by the Professional. For dredge/excavation material hauling on streets, keep streets clean as needed by sweeping, etc. The Contractor will perform sweeping as needed to remove any sediment tracked off site. Frequency of sweeping will be based on site conditions.
- D. Spoil: Spoil areas must be as shown on the drawings.

- E. Stockpiling: Topsoil, fill or other Soil Erosion and Sedimentation Control materials must be temporarily stockpiled and confined to areas shown on the drawings. Such temporary measures with stone outlet filters, silt screens, or other measures outlined under Temporary Protection of Exposed Soil. Soil stockpiles and other disturbed areas that will remain idle during construction must be temporarily stabilized using Best Management Practices.
- F. Permanent Controls: Permanent Soil Erosion and Sedimentation Control measures for all slopes, channels, ditches or any disturbed land area must be completed within 5 calendar days after final grading, or the final earth change has been completed. When it is not possible to permanently stabilize a disturbed area after an earth change has been completed or where significant earth change activity ceases, temporary Soil Erosion and Sedimentation Control measures must be implemented within 5 calendar days.
- G. Temporary Controls: In addition to temporary measures required by the Contract Documents, the Contractor must be responsible for providing any additional measures required to properly control soil erosion and sedimentation as may become necessary or may arise from conditions that may develop during construction. Except for emergencies, proposed additional temporary controls must be approved by the Owner:
1. The Contractor must maintain temporary control measures until permanent soil erosion control measures are in place and the area is stabilized. The contractor must remove temporary erosion control measures after permanent soil erosion measures are in place and the area is stabilized. Care must be taken during removal to prevent soil erosion and sedimentation.
 2. Where seasonal limitations or construction delays prevent scheduled installation of permanent Soil Erosion and Sedimentation Control measures, approved temporary measures must be installed and maintained until replaced by permanent measures.
 3. All temporary Soil Erosion and Sedimentation Control measures must be removed at the completion of construction unless ordered by the Professional to remain in place. Care must be taken during removal to minimize the entering of any sedimentation into any drainage course.
- H. Temporary Protection of Exposed Soil: Soil erosive or sediment producing areas exposed for up to 12 months may be protected by seeding or by seeding in conjunction with other measures.
- I. Seeding: Kinds and rates of seed are given in technical specifications for various planting dates. Dates to plant are also indicated.
- J. Mulching: Immediately after seeding, mulch all slopes steeper than 4:1, unstable soils, or heavy clay soils, with straw spread uniformly at the rate 2 tons per acre or other approved materials. Other suitable materials may be used at recommended rates.
1. Soil erosive or sediment producing areas exposed for six months or less, or for periods after planting dates, may be protected by mulch or other non-vegetative means.
 2. For slopes on which power equipment can be operated, satisfactory mulching must be provided by one or more of the following:

- a. Straw at 2 tons per acre anchored with either disk pack, anchoring mulch, or netting tie-down.
 - b. Mulch anchoring mixture of newsprint of wood fiber with water as needed.
3. For slopes where power equipment cannot operate satisfactorily, mulching materials must be provided by one or more of the following and must be approved by the Department of Technology, Management and Budget Soil Erosion and Sedimentation Control Guidebook:
- a. Straw at 2 tons per acre anchored with mulch anchor or netting tie-down as approved.
 - b. Approved mulch anchoring mixture with water as needed.
 - c. Commercially available erosion control nettings of jute or paper or other SESC approved Materials.
 - d. Alternative mulch systems may be installed as approved by the Professional. As approved by the Department of Technology, Management and Budget SESC Guidebook.
- K. Conversion from Temporary Protection to Permanent Vegetation: Following straw mulch, grass seeding can be made in early spring by broadcasting seed directly into mulch. Fertilizer and lime, if needed, should be incorporated into the soil before mulching:
1. Mulch anchoring mixture along can be readily incorporated into the soil with ordinary fill with seeding or sodding.
 2. Use only materials and methods approved by the State of Michigan, Department of Technology, Management and Budget SESC Guidebook with other approved manufactured materials, nettings, etc. follow manufacturer's instructions for preparation for seeding establishment.
- L. Curb and Gutter Inlets: (comply with SESC)
1. Protection must be provided for those inlets identified on the drawings. Additional protection must be provided if necessary, during construction. Use approved SESC details and methods.
 2. Low area of parking lot/street catch basins or inlets must be protected before graveling and paving by sediment pits, manufactured catch basin fiber bags approved berms in conjunction with stone filters or by other means approved by the SESC Personnel and the Professional.
 3. Approval of responsible officials must be obtained prior to locating any temporary structures in any public right-of-way.

PART 4 - METHOD OF MEASUREMENT

4.01 GENERAL

- A. All Soil Erosion and Sediment Control items will be provided as specified and required. This item shall include all material, labor, personnel, incidentals and costs associated with the work described herein.

PART 5 - BASIS OF PAYMENT

5.01 PAYMENT

- A. The LUMP SUM price for Soil Erosion and Sediment Control shall constitute full compensation for all supervision, labor, materials and equipment for the satisfactory SESC measures described herein and all other incidentals necessary for completion of the work per contract documents.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
312500.01	Soil Erosion and Sediment Control	Lump Sum

END OF SECTION

DRIVEN TIMBER PILES

SECTION 31 62 29

PART I – GENERAL

I.01 DESCRIPTION

- A. Provide all labor, materials, equipment and supervision necessary to complete work specified in this Section.
- B. Scope of work includes, but is not necessarily limited to, furnishing and installing peeled and treated timber piles for use on the timber boardwalk as shown on the drawings.
- C. Related work specified elsewhere includes:
 - a. 06 92 00, Exterior Timber Boardwalk Assemblies

I.02 QUALITY ASSURANCE

- A. Except as noted, work shall conform to the latest editions of the following codes specifications and standards:
 - a. American Society for Testing and Materials (ASTM)
 - i. ASTM D25 Specification for Round Timber Piles
 - b. American Wood Preservers' Association (AWPA)
 - i. AWPA C3. Piles – Preservative Treatment by Pressure Processes.
 - ii. AWPA C18 – Standard for Pressure treated Material in Marina Construction
 - iii. AWPA M4 – Standard for the Care of Preservative Treated Wood Products.
 - iv. AWPA C3. Piles – Preservative Treatment by Pressure Processes.
 - v. AWPA C18 – Standard for Pressure treated Material in Marina Construction
 - vi. AWPA M4 – Standard for the Care of Preservative Treated Wood Products.
 - c. Michigan, Department of Transportation Standard Specifications for Construction.
 - i. Specification 912, Timber Piles

I.03 SUBMITTALS

- A. Submit for approval by Owner proposals for the following items:
 - a. Data on round timber pile treatment, including certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
 - b. Driving plan and schedule for installation of the timber piles.
 - c. Method of installation of piles including size and type of pile hammer.
 - d. Templates and falsework to be used for support and layout of piles during driving.
 - e. The adequacy of the equipment and accessories shall remain the responsibility of the Contractor. Should the equipment used by the Contractor prove inadequate to drive the scheduled types of piles in the location indicated, or should the rate of accessories show damage to the piles, or should the Progress Schedule not be maintained, the Contractor shall replace, or use different types of equipment.
- B. Certificates:
 - a. I. Certify that materials are new and meet or exceed specification requirements.

I.04 PRODUCT HANDLING

- A. Piles shall be handled properly and with care to prevent damage to piles, in accordance with AWWA M4. Damaged piles will be rejected and replaced at no additional cost to the Owner. Piles shall be stored with a space beneath the piles and situated to prevent being exposed to standing water.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Piles: Per MDOT Specification 912, Timber Piles.
- B. Piles shall be Southern Pine and shall conform to ASTM D25, unused, clean peeled, uniformly tapered, on piece from butt to tip.
- C. Pile sizes for each type shall be as follows:

<u>MIN. CIRCUMFERENCE, 3 FT. FROM BUTT</u>	<u>MIN. LENGTH</u>
36 IN.	30 FT.

<u>MIN. CIRCUMFERENCE, AT TIP</u>
31 IN.

- D. Pressure treatment shall be in accordance with the following Use Category Standards: Land and fresh water piles. AWWA UC4C

PART 3 - EXECUTION

3.01 DRIVING EQUIPMENT

- A. Pile Hammers: Air, steam or diesel-powered, of a type approved by the Owner. The hammer furnished shall have a capacity at least equal to the hammer manufacturer's recommendation for the total weight of pile and character of subsurface material to be encountered. The minimum driving energy of the hammer shall be 12,000 foot-pounds. For piles of any length, the maximum driving energy of the hammer shall be operated at the rate recommended by the manufacturer throughout the entire driving period. Sufficient pressure shall be maintained at the hammer so that: (1) for double-acting hammer, the number of blows per minute during and at the completion of driving of a pile is equal to at least 90% of that at which the hammer is rated; (2) for single-acting hammer, there is a full upward stroke of the ram; and (3) for differential-type hammer, there is a slight rise of the hammer base during each upward stroke.
- B. Driving Helmets: The driving helmet or cap shall be capable of protecting the head of the pile, minimizing energy absorption, and transmitting the hammer energy uniformly and consistently during the entire driving period. The driving helmet or cap shall fit snugly on the top of the pile so that the energy transmitted to the pile is uniformly distributed over the entire surface of the pile head. Demonstrate to the Owner that the Equipment to be used on the project performs the above functions.

3.02 HANDLING

- A. Inspect piles in the leads, and where the protective coating is impaired the piles shall be repaired unless the pile is damaged to such extent that it is rejected. Rejected piles will be replaced at no additional cost to the Owner. Support pile laterally during driving, but not unduly restrained from rotation in the leads. Where pile orientation is essential, take special care to maintain the orientation during driving.

3.03 DRIVING PILES

- A. Piles shall be driven to the minimum tip elevations specified in the contract documents.
- B. Jetting will not be permitted unless specifically approved by the Professional for the location.
- C. Investigate any sudden decrease in driving resistance for possible breakage of the pile. If sudden decrease in driving resistance cannot be correlated to boring data or some incident in the driving, and if the pile cannot be inspected, such decrease in driving resistance may be cause for rejection of the pile.
- D. Re-drive any pile which is raised during driving of adjacent piles, to the original tip elevation.
- E. Cut off piles at top elevation directed by the Professional. Replace or repair piles which are damaged when cut off. After timber piles are cut off, treat cut surfaces in accordance with AWWPA M4. Remove cutoff sections of piles from the site and legally dispose. Top elevations specified on the drawings are intended elevations after cutoff is completed. Cut off to be horizontally level. Cut off end to be chamfered following cut.
- F. Tolerances in Driving: Heads of piles shall be within 2 inches of the location indicated. Piles shall be driven plumb. Manipulation of piles to force them into position will not be permitted. Check all piles for heave. Re-drive heaved piles to the required elevations.

3.04 INSTALLATION

- A. All piles shall be driven to the specified tip elevation. Cutoff shall be as indicated on Drawings. If installation method will require pile cutoff, Contractor is responsible for furnishing piles of sufficient length to achieve specified tip elevation and top elevation after cutoff.
- B. No splices allowed.
- D. All piles shall be marked at a given distance from the bottom, which will show above the waterline after driving so that the bottom elevation of each pile and its relation with adjacent piles can be recorded.
- E. Contractor shall notify Owner 48 hours prior to pile driving and no piles shall be driven to final position without the presence of the Owner's Representative.

3.05 RECORDS

- A. A complete and accurate record of each pile shall be furnished by the Contractor. The record shall indicate the pile location, size, length, hammer (make and model), final pile tip elevation, number of blows per inch for final 12 inches of penetration, any unusual conditions encountered during driving, and all other pertinent information.

3.06 DEFECTIVE WORK

- A. Piles damaged, mislocated, or driven out of alignment shall be replaced as directed at no additional cost to the Owner.

PART 4 – METHOD OF MEASUREMENT

4.01 TIMBER PILES

- A. Timber Pile will not be measured separately for payment.

PART 5 – BASIS OF PAYMENT

5.01 TIMBER PILES

- A. The cost of work described in this section is included in the price bid for Timber Boardwalk, Complete Item 069200.01.

END OF SECTION

PART 1 - GENERAL**1.01 DESCRIPTION**Michigan Department of Transportation Specifications

- A. All materials and construction methods used in the placement of Aggregate Base, Modified shall be in accordance with applicable provisions of the "2020 Standard Specifications for Construction", by the Michigan Department of Transportation (MDOT), which is made a part of these Contract Documents, sections of which are referred to below. This item shall be performed in accordance with Section 302 of the standard specifications with the following exceptions I.2

1.02 RELATED WORK IN OTHER SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:
- | | |
|---------------------|-----------------------------------|
| 1. DIV. 1 | General requirements |
| 2. Section 02 31 00 | Soil Preparation and Fine Grading |
| 3. Section 31 22 13 | Machine Grading, Modified |

PART 2 - PRODUCTS

- A. The CONTRACTOR may use a material which approximates the gradation for 22A gravel for all aggregate base items and it needs to allow the passage of 2% through the #200 sieve, density testing may be waived at the direction of the ENGINEER. Vibratory compaction is not allowed.

PART 3 - EXECUTION**3.01 QUALITY ASSURANCE**

- A. Thickness:
- Aggregate Base, 8" shall be placed to a compacted thickness as directed on Contract Drawings.
- B. Crushed Limestone is the preferred material for the project.

- C. Contractor may salvage and reuse aggregate excavated onsite if material meets specifications outlined in this Section 32 11 23 Aggregate Base, and with prior Owner review and approval.

PART 4 - METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. The work associated with AGGREGATE BASE, 8 Inch will be measured as a Square Yard item.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the owner for approval.

PART 5 - BASIS OF PAYMENT

5.01 PAYMENT

- A. The work associated with AGGREGATE BASE, 8 Inch Shall be paid at the SQUARE YARD price bid for the material being installed which includes materials, labor, equipment, transportation, and supervision necessary to complete the installation of items identified herein, and any incidentals necessary for completion of the specified herein as shown on the Contract drawings or as directed by the Engineer.

ITEM NO.	ITEM	PAY UNIT
321123.01	AGGREGATE BASE, 8 INCH	Square Yard

END OF SECTION

PART I - GENERAL**I.01 DESCRIPTION**Michigan Department of Transportation Specifications

- A. All materials and construction methods used in the placement of BITUMINOUS PAVEMENT and PARKING LOT STRIPING shall be in accordance with applicable provisions of the "2020 Standard Specifications for Construction", by the Michigan Department of Transportation (MDOT), which is made a part of these Contract Documents, sections of which are referred to below.
- B. The work under this item includes all materials, work and operations necessary to construct complete the permanent pavements, as herein specified.

I.02 RELATED WORK IN OTHER SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:
 - I. Section 32 11 23 Aggregate Base, 8 Inch

PART 2 - PRODUCTS**A. BITUMINOUS MATERIALS**

The bituminous mixtures to be used on this project shall meet the requirements of the most recent MDOT Special Provisions for Plant Mixed HMA Mixtures for each specified mixture. The paving subcontractor shall submit job mix formulae to the ENGINEER.

B. PARKING LOT STRIPING

The various colors, widths, and overlays for the project shall meet the requirements of the most recent MDOT Special Provisions for each specified item.

PART 3 - EXECUTION**3.01 QUALITY ASSURANCE**

- A. Thickness:

1. BITUMINOUS PAVEMENT shall be placed to a compacted thickness as directed on Contract Drawings
2. PARKING LOT STRIPING shall be placed to the noted widths and spacing as directed on Contract Drawings.

PART 4 - METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. The work associated with BITUMINOUS PAVEMENT will be measured by the TON.
- B. The work associated with PARKING LOT STRIPING will be measured by the LINEAL FOOT
- C. The work associated with CROSSWALK will be measured by EACH
- D. Prior to acceptance and final payment, the Engineer shall observe site conditions with the owner for approval.

PART 5 - BASIS OF PAYMENT

5.01 PAYMENT

- A. The work associated with BITUMINOUS PAVEMENT shall be measured for payment by the unit TON price bid and the STRIPING shall be paid as noted below which includes materials, labor, equipment, transportation, and supervision necessary to complete the installation of items identified herein, and any incidentals necessary for completion of the specified herein as shown on the Contract drawings or as directed by the Engineer.

ITEM NO.	ITEM	PAY UNIT
321216.01	HMA, 5E, 1 ½ Inch	Ton
321216.02	HMA, 3E, 2 ½ Inch	Ton
321216.03	PARKING LOT STRIPING	Feet
321216.04	CROSSWALK	Each

END OF SECTION

CRUSHED STONE PAVING

SECTION 32 14 13

PART I – DESCRIPTION

I.01 STANDARDS AND DEFINITIONS

- A. The following standard(s) as referenced herein are applicable in their entirety to work of this Section.
 - a. ASTM: American Society for Testing and Materials.
 - b. AASHTO: American Association of State Highway and Transportation Officials.
 - c. ACI - American Concrete Institute, Manual of Concrete Practice.
 - d. Percent compaction ASTM D698, percentage of the maximum in-place dry density of the same material as determined by Soils Engineer.

I.02 EXAMINATION OF SITE AND DOCUMENTS

- A. Inspect the site prior to beginning work and request clarification regarding the disposition of any conditions that are not shown on the Drawings.

I.03 SAMPLES AND SUBMITTALS

- A. At least thirty days prior to intended use, provide the following and submittals. Do not order materials until Landscape architect's review and approval of samples, certification, or test results. Delivered materials shall closely match the approved samples.
 - a. Crusher Fines
 - i. Submit a one-pound sample with a certified test result showing the full mechanical gradation in the sample.
 - b. Stabilizer
 - i. Samples and manufacturer's product literature, and certified test reports. Manufacturer's product literature for stabilizer and placement of stabilized crusher fines.

I.04 DELIVERY, HANDLING, AND STORAGE

- A. Stabilizer: store on a waterproof tarpaulin and cover with same.

I.05 TESTING

- A. Compaction testing will be arranged by the Owner's Representative and paid for by the Owner.

I.06 SURVEY

- A. Survey layout and grades will be established by surveyor paid for by the Owner.

PART 2 – PRODUCTS

2.01 CRUSHER FINES

- A. Contractor may use a material which approximates the gradation for 22A gravel for all Crushed Stone Paving subbase.
- B. Crushed Stone material shall be limestone “crusher fine” stone dust, natural white color, having the following physical properties:
 - a. Fine Aggregate:

Sieve Size	Percent Passing
#4	95-100
#30	30-50
#200	5-15
Sand Equivalent	38 minimum
 - b. Coarse Aggregate:

Sieve Size	Percent Passing
3/8"	95-100
#100	0-25
#200	0-15
- C. DeWitt Weed Barrier, or approved equal, black, multi-use woven flat ribbon polypropylene yarn with a facing of polypropylene, needle-punched fiber, as manufactured by DeWitt Company, Inc., Polypropylene Fabric Division, Highway 61 South, Sikeston, Missouri 63801, 1-800-325-0950
- D. Stabilizer Binder will be a non-toxic, organic, concentrated powder binder that is colorless and odorless and binds crushed stone or crushed brick together to produce a firm surface produced by Stabilizer Solutions Phoenix, AZ (800) 336-2468.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. VERIFICATION OF CONDITIONS:
 - a. Verify that subgrade has been rough graded for concrete paving and accepted under another section prior to commencement of work.
- B. SURFACE DRAINAGE:
 - a. Immediately report existing conflicts that will prevent drainage to the Owner’s Representative.
 - b. No ponds or other surface irregularities will be permitted. Properly correct irregularities.

3.02 CRUSHER FINES PAVING

- A. Installation:
 - a. Install flush concrete curb edging to the lines and grades and in the location and alignment shown on Drawings.
 - b. Verify that subgrades have been rough graded to lines and grades to within 0.10 ft. to accept 3 in. depth (after compaction) of crushed stone paving. Compact subbase to 95% Standard Proctor Density.

- c. Thoroughly clean sub-base of all debris, loose dirt and other extraneous materials before installing filter fabric or crusher fines. Do not install crusher fines when sub-base is wet or muddy.
- d. Place filter fabric as shown on Drawings overlapping pieces a minimum of 6 inches.
- e. Mix crushed crusher fines, stabilizer and water in concrete mixer to thoroughly blend all system components.
- f. Within 6 hours following mixing, spread blended mix to a depth sufficiently greater than 3 inches so that after compaction the minimum mixture thickness is 3 inches.
- g. Allow installed mixture to dry for a minimum of 8 hours. If rain or snow falls on newly installed mixture, allow mix to dry for at least 8 hours after precipitation has stopped or snow has completely melted.
- h. Compact installed mixture using a vibratory roller to 95% Standard Proctor Density and to the lines and grades shown on the drawings.

PART 4 – METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. The work associated with CRUSHED STONE PAVING will be measured by the Square Foot for payment. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the owner for approval.

PART 5 – BASIS OF PAYMENT

5.01 PAYMENT

- A. The work associated with CRUSHED STONE PAVING shall be included in the unit SQUARE FOOT price bid for the project being installed which includes materials, labor, equipment, transportation, survey control and supervision necessary to complete the installation of items identified herein, and any incidentals necessary for completion of the specified herein as shown on the Contract drawings or as directed by the Engineer

ITEM NO.	DESCRIPTION	Pay Item
321413.01	CRUSHED STONE PAVING	Square Foot

END OF SECTION

REINFORCED TURF RINGSSECTION 32 14 20

PART I – GENERAL

I.01 RELATED DOCUMENTS

A. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section including, but not limited to, all Drawings, all Specifications, General Conditions, and General Requirements including submittals.

B. Related Work:

1. Section 32 11 23 Aggregate Base, Modified
2. Section 32 92 00 Seed, Fertilizer, and Mulch

I.02 DESCRIPTION OF WORK

A. This work includes the following:

1. Aggregate roadbase
2. Grass Paving System and water retention polymer
3. Clean sharp sand
4. Grass seed

I.03 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer with skilled employees and a 5-year record of performance on landscaping or paving projects of comparable size using this or similar products.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when installation is in progress.

I.04 SUBMITTALS

A. Manufacturer's product data and installation instructions.

B. A 10" x 10" section of grass paving system material for review.

C. Material certificates for base course and sand fill materials.

D. Sieve analysis of base course for use under Grass Paving System.

E. Water retention soil polymer and fertilizer if other than the GrassPave2 system, which also supplies Hydrogrow, certificates for review.

I.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect grass paving system from damage during delivery and store under tarp when time from delivery to installation exceeds one week. Keep soil retention polymer in a dark and dry location.

I.06 PROJECT CONDITIONS

- A. Review installation procedures and coordinate Grass Paving System work with other work affected. Install Grass Paving System just prior to project grass installation to avoid disturbance and contamination of system.
- B. All hard surface paving adjacent to Grass Paving System areas, including concrete walks and asphalt paving, must be completed prior to installation of Grass Paving System.
- C. Prepare subgrade for grass paving system not to exceed grades on the drawings.
- D. Cold weather:
 - 1. Do not use frozen materials or materials mixed or coated with ice or frost. Do not install rolls of Grass Paving System in temperatures below 50 degrees F, as product connectors become stiff and can separate.
 - 2. Do not build on frozen ground or wet, saturated or muddy subgrade.
- E. Protect partially completed paving against damage from other construction traffic when work is in progress, and until grass root system has matured (about 4 weeks during the growing season). Any barricades constructed must still be accessible by emergency and fire equipment during and after installation.
- F. Protect adjacent work from damage during Grass Paving System installation.

PART 2 – PRODUCTS

2.01 GRASS PAVING SYSTEM

- A. Manufacturer: (Grasspave2 and Hydrogrow) Invisible Structures, Inc. Phone: 800-233-1510, www.invisiblestructures.com; OR Netpave 50 as manufactured by Netlon Turf Systems; available through Rehbein Environmental Solutions, Inc., 8651 Naples Street N E, Blaine, MN 55449, USA, Tel: (763) 784 0657, Fax: (763) 784 6001 – or approved equal.
 - I. Product must meet or exceed the specifications below including the water retention soil polymer and fertilizer.

2.02 MATERIALS

- A. Base Course to meet requirements of Section 304.11 Subbase Course, Type 1.
1. Any alternate base material, such as recycled concrete or masonry, must be submitted for approval by Project Manager, and must meet all requirements set forth in Section 32.11.23 Aggregate Base, Modified.
 2. Sources for the material can include either "pit run" or "crusher run." Crusher run material will generally require sharp sand to be added to mixture (33% by volume) to ensure long-term porosity. If there is difficulty in finding local sources to meet this sieve analysis, an alternative mixture can be created by mixing 2/3 crushed drainage rock 0.75 inch diameter with 1/3 concrete or sharp sand (AASHTO M6 or ASTM C-33).
 3. Selected materials should be nearly neutral in pH (range from 6.5 to 7.2) to provide adequate root zone development for turf.
- B. Hydrogrow Mix: A mixture made from several products including:
1. Cross-linked polyacrylimide (<0.1%) polymer, which is non-toxic and neutral in pH, and will absorb 150 to 350 times its weight in water from most tap sources;
 2. Zeolite mineral, amended with small amounts of starter fertilizers.
 3. Isolite porous ceramic, designed to hold large amounts of water without physical degradation or change of size of particle.
 4. Agglomerated Humate, a natural source of nutrients and micronutrients.
- C. Grass Paving System Units:
1. Lightweight injection-molded plastic units each with hollow rings rising from an open grid allowing maximum grass root penetration and development. The plastic shall be 100% post-consumer recycled plastic resins, predominately HDPE, with minimum 3% carbon black concentrate added for UV protection.
 2. Loading capability is equal to 5700 psi when filled with sand, over an appropriate depth of roadbase. Color: black. Product is shipped in pre-assembled rolls that vary from 108 s.f. to 1345 s.f.
- D. Sand: Clean sharp sand (washed concrete sand), ASTM C-33

PART 3 – EXECUTION

3.01 INSPECTION

- A. Examine subgrade and base course installed conditions. Do not start Grass Paving System installation until unsatisfactory conditions are corrected. Look for improperly compacted trenches, debris, and improper gradients.

- B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

- A. Place base course material over drainage mat to grades shown on plans, in lifts not to exceed 6-inches, compacting each lift separately to 95% Modified Proctor. Leave 1 ½ - inches for Grass Paving System and sand/sod fill to final grade.
- B. Spread Hydrogrow mix provided at the rate of 5 lbs. per 1000 square feet evenly over the surface of the base course with a hand-held, or wheeled, rotary spreader. Place Hydrogrow mix immediately before installing the Grass Paving System to assure that the polymer does not become wet and expanded when installing the units.

3.03 INSTALLATION OF GRASS PAVING SYSTEM

- A. Install the Grass Paving System by placing rolls with rings facing up, and using pegs provided to maintain proper spacing and interlock the units. Units can be easily shaped with pruning shears or knife. Anchor units placed on curves and slopes to the base course, using 16d common nails with fender washer, as required to secure units in place. Tops of rings must be between 0.25 inches to 0.5 inches below the surface of adjacent hard-surface pavements.
- B. Spread sand into rings using flat bottomed shovels and/or wide "asphalt rakes" to fill the rings. Use a stiff bristled broom for final leveling of the sand to at or near the top of the rings. Note the thickness of the sod and adjust the level of the sand accordingly.
- C. "Compact" sand with a hose spray being careful not to dislodge it.

3.05 CLEANING

- A. Remove and replace segments of Grass Paving System where three or more adjacent rings are broken or damaged, reinstalling as specified, so no evidence of replacement is apparent.
- B. Perform cleaning during the installation of work and upon completion of the work. Remove all excess materials, debris, and equipment from site. Repair any damage to adjacent materials and surfaces resulting from installation of this work.

PART 4 – METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. The quantity to be measured for payment shall be the number of Square Feet of Reinforced Turf Rings constructed to the lines and grades indicated on the plans.

PART 5 – BASIS OF PAYMENT

- A. The unit price bid per Square Foot of Reinforced Turf Rings shall include the cost of: furnishing and placing subbase course, soil amendments and additives, reinforced turf rings, and planting medium; preparation of subgrade, and furnishing all labor, materials and equipment necessary to complete the work. Excavation, subbase subgrade preparation and seeding/restoration shall be paid under a separate item.

Payment shall be made under:

ITEM NO.	ITEM	PAY UNIT
321420.01	Reinforced Turf Rings	Square Foot

END OF SECTION

PART I - GENERAL

I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division I Specification Sections, apply to this Section.

I.2 SUMMARY

- A. This Section includes piping, valves, sprinklers, specialties, controls, and wiring for automatic control irrigation system.
- B. The irrigation system is outlined on the Planting Page and the Contractor will need to create a layout for the system to be reviewed and approved by the Landscape Architect.

I.3 DEFINITIONS

- A. Circuit Piping: Downstream from control valves to sprinklers, specialties, and drain valves. Piping is under pressure during flow.
- B. Drain Piping: Downstream from circuit-piping drain valves. Piping is not under pressure.
- C. Irrigation Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.

I.4 PERFORMANCE REQUIREMENTS

- A. The Design Drawings indicate general locations for irrigated areas, including trees and shrub beds requiring drip irrigation, and turf areas requiring spray irrigation systems. The Contractor is responsible for the final design of a complete and functional system suitable for the project area, and infrastructure. Contractor to prepare a complete design for approval by Landscape Architect. Furnish all labor, materials, supplies, equipment, tools, and transportation, and perform all operations in connection with and reasonably incidental to complete the design and installation of the irrigation system, and guarantee/warranty as shown on the drawings, the installation details, and as specified herein.
- B. Location of Sprinklers and Specialties: System to be designed by the contractor to avoid plantings and obstructions such as buildings, signs, and light standards. Maintain efficient water coverage of planting areas indicated, with minimum overspray on adjacent paved areas, furnishings, and non-landscape areas. All turf areas to be designed to have “double coverage” from spray heads positioned to provide overlapping coverage.

- C. Minimum Working Pressures: The following are minimum pressure requirements for piping, valves, and specialties, unless otherwise indicated:
 - 1. Irrigation Main Piping: 200 psig
 - 2. Circuit Piping: 150 psig
 - 3. Drain Piping: 100 psig

I.5 SUBMITTALS

- A. Materials List: Include pipe, fittings, mainline components, water emission components, control system components. Quantities of materials need not be included.
- B. Manufacturers' Data: Submit manufacturer's catalog cuts, specifications, and operating instructions for equipment shown on the materials list.
- C. Shop Drawings: Submit complete design drawings, data, shop drawings, and installation details necessary for the installation of a complete and proper irrigation system. Shop products required for proper installation, their relative locations, and critical dimensions. Note modifications to the installation detail. Field quality-control test reports.
- E. Operation and Maintenance Data: For irrigation systems, to include in emergency, operation, and maintenance manuals. In addition to items specified in Division I Section

I.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

I.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

I.8 REVIEWS

- A. Sprinkler Layout Review:
 - 1. Notify Landscape Architect three days in advance of review. Static pressure at water supply must be verified prior to review.
 - 2. Stake each sprinkler location, remote control valve assembly, gate valve, and all other irrigation system assemblies. Different sprinkler types shall be clearly marked. Revise layout as directed by Landscape Architect. Layout review may be repeated at discretion of Landscape Architect.

3. All landscape edging, tree locations, and other known site features including athletic fields must be staked or clearly marked prior to sprinkler layout review.
4. Layout review shall occur prior to installation of irrigation system unless otherwise directed by Landscape Architect. If the layout review is not completed and properly documented, contractor assumes all liability for the location of all irrigation system components.

B. Hydrostatic Pressure Test:

1. Cap risers for hydrostatic pressure tests. Backfill to prevent pipe from moving under pressure. Expose couplings and fittings. Subject mainline pipe to a hydrostatic pressure equal to the anticipated operating pressure of 100 psi for four hours. Leakage will be detected by visual inspection. Replace defective pipe, fitting, joint, valve, or appurtenance. Repeat the test until the pipe passes the test.
- C. Pre-maintenance review will occur at substantial completion of the irrigation system and record (as-built) drawings and controller charts. Construction maintenance period will begin at a time of substantial completion.

I.9 GUARANTEE, WARRANTY AND REPLACEMENT

- A. The purpose of this guarantee/warranty is to ensure that the Owner receives irrigation materials of prime quality, installed and maintained in a thorough and careful manner.
- B. For a period of two years from the date of final completion and commencement of the formal maintenance period, guarantee/warranty irrigation materials, equipment, and workmanship against defects. Fill and repair depressions. Restore landscape or structural features damaged by the settlement of irrigation trenches or excavations. Repair damage to the premises caused by a defective item. Make repairs within three days of notification from the Landscape Architect. The Contractor is responsible for the winterization and spring start-up for the first season following installation. Provide an outline of Winterization and Spring start-up procedures to the Landscape Architect for review and approval 30 days prior to winterization and spring start-up activities to ensure compliance with Landscape Architect guidelines.
- C. Contract documents govern replacements the same as new work. Make replacements at no cost in contract price.
- D. Guarantee/warranty applies to originally installed materials and equipment and replacements made during the guarantee/warranty period.

PART 2 - PRODUCTS

2.1 QUALITY

- A. Materials used in the system shall be new and without flaws or defects of any type and shall be the best of their class and kind. Systems and components to be manufactured by Toro, Rainbird, or approved equal.

2.2 SUBSTITUTIONS

- A. Submit requests for substitutions within 15 days after the date of Owner-Contractor Agreement. Subsequent requests for substitutions will be considered only when a product becomes unavailable.
- B. Submit complete data showing compliance with the Contract Documents.
- C. In making a request for substitution, the Contractor represents that he:
 - 1. Has investigated the proposed substitution and found that it is of the same or better-quality level, capacity, function, or appearance than the specified product.
 - 2. Will coordinate installation and make modifications to the work which may be required for complete installation.
 - 3. Will bear all costs resulting from necessary changes caused by the substitution.
- D. The Landscape Architect will determine acceptability of proposed substitution and will notify Contractor of acceptance or rejection.
- E. Pipe sizes shall be determined by the contractor to ensure optimum performance of the system.

2.3 SLEEVING

- A. Install separate sleeve beneath paved areas to route each run of irrigation pipe or wiring bundle.
- B. Sleeving material beneath pedestrian pavements shall be PVC Class 200 pipe with solvent welded joints.
- C. Sleeving beneath drives and streets shall be PVC Class 200 pipe with solvent welded joints.
- D. Sleeving Diameter: Twice the diameter of the pipe or wire bundle passing through it.

2.4 PIPE AND FITTINGS

- A. Irrigation Mainline Pipe and Fittings:
 - 1. Use rigid, unplasticized polyvinyl chloride (PVC) 1120, 1220 National Sanitation Foundation (NSF) approved pipe, extruded from material meeting the requirements of Cell Classification 12454-A or 12454-B, ASTM Standard D1784, with an integral belled end.
 - 2. Use Schedule 40 conforming to the dimensions and tolerances established by ASTM Standard D17853. for mainline pipe with a nominal diameter less than 4 inches
 - 3. Use Class 200, SDR-21, rated at 200 psi, conforming to the dimensions and tolerances established by ASTM Standard D2241 for mainline pipe with a nominal diameter greater than or equal to 4 inches
 - 4. Use rubber-gasketed pipe for mainline pipe with a nominal diameter greater than or equal to 4 inches and rubber-gasketed prefabricated PVC fittings with lubricant approved by the pipe manufacturer. Gasket shall be cast iron O.D. pipe as required.

5. Use solvent weld pipe for mainline pipe with a nominal diameter less than four inches or where a pipe connection occurs in a sleeve.
 6. Use Schedule 40, Type I, PVC solvent weld fittings conforming to ASTM Standards D2466 and D1784. Use primer approved by the pipe manufacturer. Solvent cement to conform to ASTM Standard D2564.
- B. Circuit (Lateral) Pipe and Fittings:
1. Use rigid, unplasticized polyvinyl chloride (PVC) 1120, 1220 National Sanitation Foundation (NSF) approved pipe, extruded from material meeting the requirements of Cell Classification 12454-A or 12454-B, ASTM Standard D1784, with an integral belled end.
 2. Use Class 200, SDR-21, rated at 200 psi, conforming to the dimensions and tolerances established by ASTM Standard D2241
 3. Use Schedule 40, Type I, PVC solvent weld fittings conforming to ASTM Standards D2466 and D1784. Use primer approved by the pipe manufacturer. Solvent cement to conform to ASTM Standard D2564.
- A. Drip Laterals:
1. For drip irrigation laterals downstream of zone control valves, use UV radiation resistant polyethylene pipe manufactured from Prime Union Carbide G-resin 7510 Natural 7 manufactured by Union Carbide or a Union Carbide Licensee with a minimum 2% carbon black.
 2. Fittings shall be PVC compression fittings compatible with the drip lateral pipe, as presented in the installation details. Use tubing stakes to hold above-ground pipe in place.
- C. Specialized Pipe and Fittings:
1. Copper pipe: Type "K" rigid conforming to ASTM Standard B88. Fittings shall be wrought copper or cast bronze, soldered or threaded per the installation details. Solder shall be 95% tin and 5% antimony.
 2. Galvanized and steel pipe: Schedule 40 galvanized steel pipe, ASTM Standard A120. Fittings shall be galvanized, threaded, standard weight, malleable iron fittings.
 3. Use a dielectric union wherever a copper-based metal (copper, brass, bronze) is joined to an iron-based metal (iron, galvanized steel, stainless steel).
 4. Assemblies calling for threaded pipe connections shall utilize PVC Schedule 80 nipples and PVC Schedule 40 threaded fittings.
 5. Joint sealant: Use only Teflon-type tape pipe joint sealant on plastic threads. Use nonhardening, nontoxic pipe joint sealant formulated for use on water-carrying pipes on metal threaded connections.
- ## 2.5 MAINLINE COMPONENTS
- A. Isolation Gate Valve Assembly: As presented in the installation details.
- B. Quick Coupling Valve Assembly: Double swing joint arrangement as presented in the installation details.
- C. Master Valve Assembly: As presented in the installation details.

- D. Flow Sensor Assembly: As presented in the installation details.

2.6 SPRINKLER AND BUBBLER IRRIGATION COMPONENTS

- A. Remote Control Valve (RCV) Assembly for Sprinkler and Bubbler Laterals: As presented in the approved installation details.
- B. Sprinkler Assembly: As presented in the approved shop drawings and installation details.

2.7 CONTROL SYSTEM COMPONENTS

A. Irrigation Controller Unit:

1. As presented in the approved drawings and installation details.
2. Wire markers: Pre-numbered or labeled with indelible non-fading ink, made of permanent, non-fading material.
3. Primary surge protection arrestors: As per manufacturer's recommendations.
4. Valve output surge protection arrestors: As per manufacturer's recommendations.
5. Provide means of power shut-off at each controller location.
6. Each controller to include a "Trouble Shooting Kit" as provided by the controller manufacturer.

B. Control Wire:

1. Electric wire from the satellite control unit to each remote-control valve shall be American Wire Gauge (AWG) No. 14 solid copper, Type UF cable, UL approved for direct underground burial. Common wire shall be AWG No. 12 solid copper, Type UF cable, UL approved for underground burial.
2. Color: Wire color shall be continuous over its entire length. Use wire colors as follows:
 - White: Common Wire
 - Yellow: Spare Wires
 - Red: Spray and Rotor Zones
 - Blue: Bubbler and Drip Zones
 - Black: Common Dedicated to Master Valve
 - Orange: Master Valve
3. Splices and connection shall be connected using the 3M-DBY direct bury splice kit.
4. Warning tape: Inert plastic film highly resistant to alkalis, acids, or other destructive chemical components likely to be encountered in soils. Three inches wide, colored yellow, and imprinted with "CAUTION: BURIED ELECTRIC LINE BELOW."

C. Communication Cable:

- I. Provide Communication cable and connections necessary to connect all specified controllers to the appropriate existing Control Unit. Coordinate Control Unit location with owner. All communication wiring not installed with mainline must be marked with warning tape indicating "Irrigation Control Wire Below" or as approved by the owner.

2.8 OTHER COMPONENTS

- A. Tools and Spare Parts: Provide operating keys, servicing tools, test equipment, other items, and spare parts indicated in the General Notes of the drawings.

PART 3 - EXECUTION

3.1 INSPECTIONS AND REVIEWS

A. Site Inspections:

- I. Verify site conditions and note irregularities affecting work of this section. Report irregularities to the Landscape Architect prior to beginning work.
2. Beginning work of this section implies acceptance of existing conditions.

- B. Irrigation System Layout Review: Irrigation system layout review will occur after the layout has been completed. Notify the Landscape Architect two days in advance of review. Modifications will be identified by the Landscape Architect at this review.

- C. Verify locations of underground utilities.

3.2 LAYOUT OF WORK

- A. Stake out the irrigation system. Items to be staked include sprinklers, pipe, control valves, controller, and isolation valves.

3.3 EXCAVATION, TRENCHING, AND BACKFILLING

- A. Excavate to permit the pipes to be laid at the intended elevations and to permit workspace for installing connections and fittings.

- B. Minimum cover over all pipe and wire shall be as presented in the installation details.

- C. Backfill only after lines have been reviewed and tested.

- D. Excavated material is generally satisfactory for backfill. Backfill shall be free from rubbish, vegetable matter, frozen materials, and stones larger than 2 inches in maximum dimension. Remove

material not suitable for backfill. Backfill placed next to pipe shall be free of sharp objects which may damage the pipe.

- E. Backfill unsleeved pipe in either of the following manners:
 - 1. Backfill and puddle the lower half of the trench. Allow to dry 24 hours. Backfill the remainder of the trench in 6-inch layers. Compact to density of surrounding soil.
 - 2. Backfill the trench by depositing the backfill material equally on both sides of the pipe in 6-inch layers and compacting to the density of surrounding soil.
- F. Enclose pipe and wiring beneath roadways, walks, curbs, etc., in sleeves. Minimum compaction of backfill for sleeves shall be 95% Standard Proctor Density, ASTM D 698-78. Use of water for compaction around sleeves, "puddling," will not be permitted.
- G. Dress backfilled areas to original grade. Incorporate excess backfill into existing site grades.
- H. Where utilities interfere with irrigation trenching and pipe work, contact the Landscape Architect for trench depth adjustments.

3.4 SLEEVING AND BORING

- A. Install sleeving at a depth which permits the encased pipe or wiring to remain at the specified burial depth.
- B. Extend sleeve ends twelve (12) inches beyond the edge of the paved surface. Cover pipe ends and mark with stakes. Mark concrete with a chiseled "X" at sleeve end locations.
- C. Bore for sleeves under obstructions which cannot be removed. Employ equipment and methods designed for horizontal boring.
- D. Sleeving diameter: As indicated on the installation details.

3.5 ASSEMBLING PIPE AND FITTINGS

- A. General:
 - 1. Keep pipe free from dirt and pipe scale. Cut pipe ends square and debur. Clean pipe ends.
 - 2. Keep ends of assembled pipe capped. Remove caps only when necessary to continue assembly.
- B. Mainline Pipe and Fittings:
 - 1. Use only strap-type friction wrenches for threaded plastic pipe.

2. PVC Rubber-Gasketed Pipe:
 - a. Use pipe lubricant. Join pipe in the manner recommended by the manufacturer and in accordance with accepted industry practices.
 - b. Ductile iron fittings shall not be struck with a metallic tool. Cushion blows with a wood block or similar shock absorber.
 3. PVC Solvent Weld Pipe:
 - a. Use primer and solvent cement. Join pipe in a manner recommended by the manufacturer and in accordance with accepted industry practices.
 - b. Cure for 30 minutes before handling and 24 hours before allowing water in pipe.
 - c. Snake pipe from side to side within the trench.
- C. Circuit (Lateral) Pipe and Fittings:
1. Use only strap-type friction wrenches for threaded plastic pipe.
 2. PVC Solvent Weld Pipe:
 - a. Use primer and solvent cement. Join pipe in the manner recommended by manufacturer and in accordance with accepted industry practices.
 - b. Cure for 30 minutes before handling and 24 hours before allowing water in pipe.
 - c. Snake pipe from side to side within the trench.
 3. UV Radiation Resistant Polyethylene Pipe:
 - a. Join pipe in the manner recommended by manufacturer and in accordance with accepted industry practices.
 - b. Snake pipe from side to side on the soil surface and hold in place with tubing stakes spaced every four feet.
- C. Specialized Pipe and Fittings:
1. Copper Pipe:
 - a. Buff surfaces to be joined to a bright finish. Coat with solder flux.
 - b. Solder so that a continuous bead shows around the joint circumference.
 2. Insert a dielectric union wherever a copper-based metal (copper, brass, bronze) and an iron-based metal (iron, galvanized steel, stainless steel) are joined.
 3. PVC Threaded Connections:
 - a. Use only factory-formed threads. Field-cut threads are not permitted.
 - b. Use only Teflon-type tape.
 - c. When connection is plastic-to-metal, the plastic component shall have male

4. Make metal-to-metal, threaded connections with Teflon-type tape or pipe joint compound applied to the male threads only.

3.6 INSTALLATION OF MAINLINE COMPONENTS

- A. Isolation Gate Valve Assembly: Install where indicated on the drawings.
- B. Quick Coupling Valve Assembly: Install where indicated on the drawings.
- C. Master Valve Assembly: Install where indicated on the drawings.
- D. Flow Sensor Assembly: Install where indicated on the drawings.

3.7 INSTALLATION OF SPRINKLER AND BUBBLER IRRIGATION COMPONENTS

- A. Remote Control Valve (RCV) Assembly for Sprinkler and Bubbler Laterals:
 1. Flush mainline before installation of RCV assembly.
 2. Install where indicated on the drawings. Wire connectors and waterproof sealant shall be used to connect control wires to remote control valve wires. Install connectors and sealant per the manufacturer's recommendations.
 3. Adjust RCV to regulate the downstream operating pressure.
- B. Sprinkler Assembly:
 1. Flush lateral pipe before installing sprinkler assembly.
 2. Install per the installation details at locations shown on the drawings.
 3. Set sprinklers perpendicular to the finish grade.
 4. Supply appropriate nozzle or adjust arc of coverage of each sprinkler for best performance.
 5. Adjust the radius of throw of each sprinkler for best performance.

3.8 INSTALLATION OF CONTROL SYSTEM COMPONENTS

- A. Irrigation Control Units:
 1. The locations of the control units as depicted on the drawings are in the restroom building and are noted on the drawings
 2. Install electrical connections between control components and valves per manufacturer's recommendations.
 3. Lightning protection: Drive three 8-foot copper-clad grounding rods into the soil in a triangular arrangement 48" apart. If rock prevents driving, bury at least four feet deep. A single rod may be used for grouped control units. Connect control unit to grounding rod with AWG No. 10 solid conductor copper wire. Secure wire to grounding rod with brass or bronze clamp. Locate the connection in a separate valve box.
 4. Attach wire markers to the ends of control wires inside the control unit housing. Label wires with the identification number (see drawings) of the remote-control valve or control unit to which the control wire is connected.
 5. Connect control wires to the corresponding control unit terminals.

3. Provide means of power shut off at each controller location.
- B. Control Wire:
1. Bundle control wires where two or more are in the same trench. Bundle with pipe wrapping tape spaced at 10-foot intervals.
 2. Provide a 24-inch excess length of wire in an 8-inch diameter loop at each 90-degree change of direction, at both ends of sleeves, and at 100-foot intervals along continuous runs of wiring. Do not tie the wiring loop. Coil 24-inch length of wire within each remote-control valve box.
 3. Install common ground wire and one control wire for each remote-control valve. Multiple valves on a single control wire are not permitted. Install five (5) spare control wires along the entire length of the main line. Provide a 36-inch length of wire from each end of the spare control wires coiled in the control enclosure and provide a 24-inch length of coiled wire for each spare control wire in a 6-inch round valve box at each distal end of the mainline pipe.
 4. If a control wire must be spliced, make splice with 3M-DBY direct burial splice kit, installed per the manufacturer's instructions. Locate splice in a valve box which contains an irrigation valve assembly, or in a separate 6-inch round valve box. Use identical procedure for connection to valves as for in-line splices.
 5. Unless noted on plans, install wire parallel with and under PVC mainline pipe.
 6. Protect wire not installed with PVC mainline pipe with a continuous run of warning tape placed in the backfill six inches above the wiring.

3.9 INSTALLATION OF OTHER COMPONENTS

- A. Tools and Spare Parts:
1. Prior to the Pre-Maintenance Review, supply to the Owner operating keys, servicing tools, test equipment, and any other items indicated on the drawings.
 2. Prior to Final Review, supply to the Owner the spare parts indicated in the General Notes on the drawings.
- B. Other Materials: Install other materials or equipment shown on the drawings or installation details to be part of the irrigation system, even though such items may not have been referenced in these specifications.

3.10 PROJECT RECORD DRAWINGS

- A. Prior to Pre-Maintenance Review, obtain from the Landscape Architect AutoCAD base file of the original design documents. Duplicate information contained on the Record Drawings maintained on site. Prepare all irrigation As-Built Drawings in AutoCAD DWG format. Provide 2 hard copies and DWG files on CD.
- B. Label each sheet "Record Drawing". On the first sheet, the Contractor or resident superintendent shall execute the following statement:
Having reviewed this document and all attachments, I affirm that, to the best of my knowledge, the information presented here is true and accurate.

Signed: _____ Date: _____

Position: _____

- D. Record pipe and wiring network alterations. Record work which is installed differently than shown on the construction drawings. Record accurate reference dimensions, measured from at least two permanent reference points, of each irrigation system valve, each backflow prevention device, each controller or control unit, each sleeve end, and other irrigation components enclosed within a valve box.

3.11 CONTROLLER CHARTS

- A. Prior to Pre-Maintenance Review, prepare a reduced copy of the as-built plans, with valve numbering clearly highlighted at the reduced scale. The reduced plan shall be sized to fit flat within the controller, laminated in plastic, and placed in the controller.
- B. Provide controller charts for each controller. Controller charts should be developed with the highest irrigation water demand for the season (usually peak of the summer) as the basis for the schedule. If repeat cycles are used, note the proper number of repeat operations and the timing of each repeat.
- A. Prior to Pre-Maintenance Review, prepare a reduced copy of the record plans, with valve numbering clearly highlighted at the reduced scale. The reduced plan shall be sized to fit flat within the controller, laminated in plastic, and placed in the controller.
- B. Provide controller charts (see attached example) for each controller. Controller charts should be developed with the highest irrigation water demand for the season (usually peak of the summer) as the basis for the schedule. If repeat cycles are used, note the proper number of repeat operations and the timing of each repeat.
- C. Where central control system is used provide Initial controller programming using applicable control management software. System timing must be based on system precipitation rates and local monthly ET values. Programming shall be coordinated with appropriate management personnel.

PART 4 - METHOD OF MEASUREMENT

4.01 IRRIGATION SYSTEM, COMPLETE

- A. The Irrigation System will be measured as noted below.

PART 5 - BASIS OF PAYMENT

5.01 IRRIGATION SYSTEM, COMPLETE

The basis of payment shall be as noted below for the Irrigation System, Complete, and will include, but not limited to, the complete irrigation system and all components listed herein. The amount bid shall include all labor, materials and equipment required to complete the work.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
328400.01	IRRIGATION SYSTEM, COMPLETE	Lump Sum

PART I - DESCRIPTION**I.01 GENERAL**

- A. Furnish all labor, materials, supplies, equipment, tools, and perform all operations in connection with and reasonably incidental to complete the installation of seed, fertilizer and hydromulch and guarantee/warranty as shown on the drawings and as specified herein. Items of work specifically include but are not limited to: seeding, fertilizer, hydromulch, and maintenance.

I.02 WORK NOT INCLUDED

- A. Earthwork and grading, planting trees, shrubs, groundcovers, native seeding and irrigation are not included in this Section.

I.03 QUALITY ASSURANCE

- A. Seed Materials: Subject to inspection and acceptance. The Landscape Architect reserves the right to reject at any time prior to acceptance, any work and seed materials which fail to meet these specification requirements.
 - 1. Inspection: Primarily for quality; however, other requirements are not waived even though visual inspection results in acceptance. Notify Landscape Architect of intended sod farm for inspection prior to cutting. Inspection at growth site shall not preclude the right of rejection at project site.
 - 2. Promptly remove rejected seed materials from site.
 - 3. The Landscape Architect will make inspection during seeding operations, at completion and at end of warranty period.
- B. Warrant all seeds to be true to botanical name.
- C. Contractors' Qualifications:
 - 1. The work in this section shall be performed by a qualified contractor specializing in sodding, seeding and landscape operations.
 - 2. Qualifications of workers: Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with type of materials being installed and best methods for their installation and who shall direct all work performed under this section.
 - 3. The term qualified means experienced in performing the Work required by this section. The qualified installer shall have a minimum of five (5) years documented experience on

Projects similar in size and scope to this Project. The installer shall submit evidence of such qualifications upon request by the Landscape Architect.

- a. Employ qualified, experienced landscape personnel. The Landscape Contractor must have a minimum of five (5) years of experience in large scale projects.
- D. Perform Work in accordance with the latest edition of the appropriate divisions, of the following:
1. The work under this section shall be done in accordance with applicable portions of the Special Conditions except as modified herein.
 2. All Local and National Codes as applicable for fertilizer and herbicide composition.
 3. All plants and planting materials shall meet or exceed specifications of federal, state and local laws requiring inspection for plant disease and insect control.
 4. Provide plant materials complying with ANSI Z60.1.

I.04 REFERENCES

- A. Reference Standards: U.S. Department of Agriculture Rules and Regulations under Federal Seed Act and equal in quality to standards for Certified Seed.

I.05 SUBMITTALS

- A. Seed
1. Submit proposed list of seed blends with species, common, and botanical names of each seed in each mix and percentage of each species contained in each mix.
 2. Certificates: submit State, Federal and other inspection certificates with the invoice for materials showing source or origin. Submit to Landscape Architect prior to acceptance of material, legible copies of all seed mix analysis reports.
 3. Submit all seed bag tags for all seed installed on site. Submit a certification from the supplier stating the seed complies with the Federal Seed Act. All seed shall be furnished in bags or containers clearly labeled to show the name and address of the supplier, the seed name, the lot number, net weight, origin, the percent of weed seed content, the guaranteed percentage of purity and germination, pounds of pure live seed (PLS) of each seed species, and the total pounds of PLS in the container. List the seed species name on the "Certified Seed Blue Tag," verify that the seed received is the seed specified.
- B. Fertilizers: Submit manufacturer's product literature for all chemical and organic fertilizers to be used on seeded areas. Furnish delivery receipts for all organic and chemical fertilizers used.
- C. Hydromulch and Tackifier: Submit manufacturer's product literature for all products contained in the hydromulch mix, mixing recommendations, and test results prior to delivery. Following delivery to site, submit all delivery receipts and quantity totals for all hydromulch fiber bales, tackifiers, and associated materials showing source or origin prior to acceptance of materials.
- D. Warranty: At completion of work, furnish written warranty for seeded areas to Landscape Architect based upon requirements as specified.

I.06 DELIVERY, STORAGE, AND HANDLING

- A. Hydromulch and Tackifier: Deliver to site in unopened bales or containers bearing manufacturer's name, trade name, trademark, warranty and conformance to state law. All materials provided shall come from the same manufacturer and have the same product type and specifications.
- B. Seed: Deliver seed to site in original unopened container bearing manufacturer's guaranteed seed analysis, name, trade name, trademark, warranty and conformance to state law. Upon request, submit to Landscape Architect all seed analysis container labels for all seed installed on site.
 - 1. Store seed in cool, dry place prior to application.
 - 2. Material shall be inspected upon arrival at the job site.
 - 3. Unacceptable materials shall be immediately removed from the job site.
- C. Fertilizer: Deliver inorganic or chemical fertilizer to site in original unopened container bearing manufacturer's guaranteed chemical analysis, name, trade name, trademark, warranty and conformance to state law.
 - 1. Material shall be inspected upon arrival at the job site.
 - 2. Immediately remove unacceptable material from job site.

I.07 ENVIRONMENTAL CONDITIONS

- A. Existing Conditions:
 - 1. Import and place any fill material required to adjust the fine grade to meet drainage requirements or to match hard surface fine grades.
 - 2. Vehicular accessibility on site subject to approval of Landscape Architect. Repair damage to prepared grounds and surfaces caused by vehicular movement during work under this section, to original condition at no additional cost to Owner.
 - 3. Environmental Requirements: Do not install seed on saturated or frozen soil.

I.08 GUARANTEE AND REPLACEMENT

- A. Seed: Warrant seed for a period of two (2) years from date of Substantial Completion to be in a healthy, vigorous growing condition typical of seed.
 - 1. During the original warranty period, replace at once all seed areas that die due to natural causes, etc., or which in Landscape Architect opinion are unhealthy.
 - 2. Replacement will not be required in any season unfavorable for seeding.

- 3. Install replacements as originally specified and warranted.
 - 4. Seed shall be visibly germinating, depending on the season and weather conditions during which it was applied, within 30 days. Expect to have small individual plants visible in rows. Any deficiency shall be evaluated and re-seeded until suitable coverage is achieved.
- B. Hydromulch and Tackifier: Warrant installation for a period of two (2) years from date of Substantial Completion.

I.09 MAINTENANCE

- A. General: The maintenance period shall begin immediately after each area is seeded. Installer will maintain seeded areas for a period of 90 days following installation prior to Final Acceptance at which time the Landscape Maintenance period will begin. During the 90-day maintenance period, the Contractor shall be responsible for watering, mowing, spraying, weeding, aerating, fertilizing, and all related work as necessary to ensure that seeded areas are in a vigorous growing condition. Furnish all supervision, labor, material and equipment to maintain seeded areas, including irrigation winterization and start-up procedures.

PART 2 - PRODUCTS

2.01 QUALITY

- A. All materials used for seeding shall be new and without flaws or defects of any type, and shall be the best of their class and kind.

2.02 SEED MIX

- A. Grass Seed shall be re-cleaned seed of seed crop from the year stipulated in the project specification. All seed shall meet the requirements established by the State and Federal Seed and Weed Control Laws, covering law on "Agricultural Seed." Seeds shall meet the following requirements in respect to purity and germination.

	Purity %	Pure Live Seed %	Weed Seed %
Seed Variety	Minimum	Minimum	Maximum
Alkaligrass, "Fulfs"	98	85	0.10
Fescue, Creeping Red	75	82	1.00
Fescue, Fine-Leaf	92	85	0.10

	Purity %	Pure Live Seed %	Weed Seed %
Seed Variety	Minimum	Minimum	Maximum
Fescue, Hard	97	85	0.10
Fescue, Red	97	85	0.10
Fescue, Tall	92	88	1.00
Kentucky Bluegrass	75	72	0.50
Redtop	75	78	1.80
Ryegrass, Annual	92	88	0.50
Ryegrass, Perennial	92	88	0.50

- B. The percentage of hard seed included as a part of the germination percentage of any lot of seed, shall not exceed twenty. Kentucky Blue Grass seed shall weigh a minimum of 21 pounds to the measured bushel and for all seeding shall be of the crop year indicated in the project specifications.

- C. Packing and Marking: All seed shall be delivered in sacks unmixed. Seeds shall be packed for delivery in suitable bags in accordance with standard commercial practice. Each bag shall be tagged or labeled as required by the law of the State of Michigan. The vendor’s name shall show on or be attached to each bag, together with a statement signed by the vendor, showing:
 - 1. The kind of seed contained;
 - 2. The percentage of purity and germination;
 - 3. The percentage of hard seed, if any;
 - 4. A statement conforming to the laws of the State of Michigan as herein before mentioned, showing percentage of weed seeds if any.

- D. Grass Seed Mixes: The seed shall be mixed thoroughly in the following proportions, by weight. Where specified varieties are not available, alternative varieties must be approved in writing by the project manager prior to ordering.

General Turf/Athletic Field Grass Seed Mix:

“Appalachian” Kentucky Bluegrass	20%
“Elfkin” Perennial Ryegrass	20%
“Esquire” Perennial Ryegrass	20%
“Fourtuna” Kentucky Bluegrass	20%
“Rugby” M Kentucky Bluegrass	20%

Shade Tolerant Grass Seed Mix:

“Rose” Creeping Red Fescue	30%
“Esquire” Perennial Ryegrass	20%
“Wrigley’s” Chewings Fescue	15%
“Geronimo” Kentucky Bluegrass	15%
“Appalachian” Kentucky Bluegrass	10%
“Ridu” Hard Fescue	10%

Low-Mow Grass Seed Mix:

“Bighorn” Sheeps Fescue	25%
“Discovery” Hard Fescue	25%
“Shademaster II” Creeping Red Fescue	25%
“Tiffany” Chewings Fescue	25%

2.03 WATER

- A. The Contractor will confirm water source prior to beginning construction. Water will be supplied by contractor at no cost to Owner until irrigation system is in full operation at which time Owner will pay for water metered to irrigation system.

2.04 FERTILIZER

- A. Commercial fertilizers may be used to provide the nutrient components specified, or as directed by the Landscape Architect, in order to meet the requirements recommended by soil tests as required under Soil Preparation Section.
- B. Fertilizer shall be designated as appropriate for use in close proximity to lakes and streams.
- C. Commercial fertilizer shall conform to the applicable State fertilizer laws. It shall be uniform in composition, dry, and free flowing, and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Fertilizer, which becomes caked or damaged, will not be accepted.
- D. Organic slow-release fertilizer mix for seed areas.
- E. Organic slow-release fertilizer mix or approved equal for turf lawn areas.
- F. When applied as a topsoil amendment, fertilizer shall have an analysis that will deliver appropriate amounts of nitrogen, phosphorus, and potassium as required to remedy deficiencies revealed by testing of the topsoil.
- G. 50% of nitrogen shall be derived from natural organic sources of ureaform. Available phosphorous shall be derived from superphosphate, bone meal, or tankage. Potassium shall be derived from muriate of potash containing 60% potash.
- H. Fertilizer shall be delivered in manufacturer's standard container printed with manufacturer's name, material weight, and guaranteed analysis.

- I. Fertilizers with N-P-K analysis other than that stated above may be used provided that the application rate per square foot of nitrogen, phosphorous, and potassium is equal to that specified.

2.05 HYDROMULCH

A. Wood Cellulose Fiber Mulch: Hydromulch material shall consist of virgin wood cellulose fibers manufactured from clean whole wood chips. Fiber shall not be produced from recycled materials such as sawdust, paper, cardboard, or residue from pulp and paper plants. Fiber shall not contain germination or growth inhibiting factors. It shall be dyed a green color to allow visual metering of its application. Dye shall be biodegradable. The fiber shall be sprayed uniformly on the seeded soil surface, providing a cover that readily absorbs water and infiltration to the soil below. Wood cellulose fibers of mulch must maintain uniform suspension in water under agitation. Suppliers shall be prepared to certify that laboratory and field-testing of their product has been accomplished, and that it meets all of the foregoing requirements.

- I. The wood cellulose fiber mulch shall conform to the following specifications:

Percent moisture content	10.0% +/- 3.0%
Percent Organic Matter*	99.3% +/- 0.2%
Percent Ash Content*	0.7% +/- 0.2%
pH	4.9 +/- 0.5
Water Holding Capacity*	**1200-1600 grams
*Oven-dried Basis	**Per 100 grams of fiber

- 2. Hydro-Mulch: Canfor EcoFibre or approved equal for all seeded areas.

B. Tackifier: Mulch tackifier shall consist of a free-flowing, noncorrosive powder produced from the natural plant gum of *Plantago insularis* (Desert Indianwheat), applied in a slurry with water and the wood cellulose fiber mulch.

- I. The tackifier shall possess the following properties:

Protein content	1.6% +0.2%
Ash Content	2.7% +0.2%
Fiber	4.0 +0.4%
pH 1% solution	6.5 - 8.0

- 2. Tackifier: Rantec R-Tack Plantago Tackifier or approved equal.

PART 3 - EXECUTION

3.01 INSPECTIONS AND REVIEW

A. Site inspection and review: Verify that existing site conditions are as specified and indicated before beginning work under this section. Verify layout of seeded areas as indicated prior to starting operations. Verify fine grading is complete and accepted by the Landscape Architect and is within +/-0.10 ft. of grades indicated on plans.

B. Unsatisfactory Conditions: Report in writing to Landscape Architect.

C. Beginning of work in this section implies acceptance of existing conditions by the Contractor.

3.02 CONSTRUCTION REQUIREMENTS

A. Seeding Seasons:

1. Spring Seeding – Spring thaw to May 15th (without irrigation); Spring thaw to June 15th (with irrigation).
2. Fall Seeding – August 30th to consistent ground freeze (without irrigation); August 1 to consistent ground freeze (with irrigation).
3. "Spring thaw" shall be defined as the earliest date in a new calendar year in which seed can be buried 1/2 inch into the surface soil (topsoil) through normal drill seeding methods.
4. "Ground freeze" shall be defined as that time during the fall months in which the surface soil (topsoil), due to freeze conditions, prevents burying the seed 1/2 inch through normal drill seeding operations. Seed shall not be sown, drilled, or planted when the surface soil or topsoil is in a frozen or crusted state.

B. Seeding accomplished outside the time periods listed above will be allowed only when ordered by the Landscape Architect or when the Contractor's request is approved in writing. When requested by the Contractor, the Contractor must agree to perform the following work at no additional cost.

1. Apply the specified seed and mulch at a rate of not less than 25 percent greater per unit area than the rates specified for use within the time periods listed above.
2. Re-seed, re-mulch, and repair areas which fail to produce vegetation.

C. The seeding and the fertilizing application rate shall be as specified. The Landscape Architect may establish seeding test sections to measure seeding rates and to determine if seeding and fertilizing equipment requires adjustment to assure the specified seeding rate.

3.03 SITE PREPARATION

A. Responsibility:

1. Repair or replace any areas or elements damaged by the work of this section including but not limited to: landscape, utilities, fences, and pavements.
2. Identify prepared seed areas requiring protection and shall provide traffic control.

B. Clearing: Prior to any soil preparation, the ground surface shall be cleared of materials, which might hinder final operations. Remove all weeds from proposed seeding areas where topsoil has been placed.

1. Seed Areas: Remove weeds, debris, rubble, rocks and plant material larger than 1 1/2" not scheduled to remain.

C. Fine Grading: See Section 02310 "Soil Preparation and Fine Grading"

- D. Inspection: Do not lay sod until base preparation and planted depth of trees and shrubs has been inspected and accepted by Landscape Architect.
- E. Coordinate restoration of fine grade to establish the sub-grade at the following depths below design finished grade:

	Adjacent to Curbs & Other Hard Surfaces	Open Areas
a. Seeded areas	1/2"	0" + 1"

3.04 FERTILIZING

- A. Seeded Area Preparation: Spread the following amendments over the entire area to be seeded and incorporate into the top four inches of soil by discing, or rototilling until a uniform mixture is obtained with no pockets of soil or amendments remaining:
 - 1. Organic Compost, Refer to Section 02310 – Soil Preparation.
 - 2. Pre-planting Fertilizer: apply liquid organic fertilizer only to these seeded areas only if soils report indicates the need to add fertilizer for seed areas. Consult Landscape Architect after soil sample tests have been completed to determine need for fertilizer application.
 - 3. Subsequent Applications: do not apply fertilizer after initial seeding.

3.05 SEEDING

- A. Seed within 5 days of completion of accepted soil preparation and/or topsoil placement to prevent weed invasion.
- B. Seed only during the spring or fall seeding season specified.
- C. Complete soil preparation as specified.
- D. Drill seed all areas to be seeded using a mechanical power drawn drill followed by packer wheels or drag chains.
 - 1. Use a range drill seeder capable of handling seed. Mechanical power drawn drills shall have depth bands set to maintain a planting depth of at least .025 to 0.5 inches into the soil and shall be set to space the rows not more than seven inches apart. Seed that is extremely small shall be sowed from a separate hopper adjusted to the proper rate of application. On slopes greater than 4:1 the contractor will broadcast seed on freshly disturbed (raked or harrowed) soil surfaces. Following broadcast seeding the contractor shall immediately rake or harrow the seeds into the surface. Raking shall be accomplished using metal-tined garden or landscape rakes. If harrowing is used, an English harrow or its equivalent shall be used. Seed must be uniformly distributed in the broadcasting device, and seed must be evenly distributed throughout the re-vegetation site.
 - 2. Cover the applied seed with a soil thickness no greater than 0.5 inches in depth.

3. Seeded areas damaged due to circumstances beyond the Contractor's control shall be repaired and re-seeded as ordered. Payment for this corrective work, when ordered, shall be at the contract unit prices.

3.06 HYDROMULCHING - Grass seed mix

- A. Following the installation of seed as specified, hydromulch all seeded areas. Incorporate hydromulch materials and water to form a homogeneous slurry. Slurry shall be applied evenly in a minimum of two (2) passes over the seeded areas. The first pass shall apply 50% of material from the bottom of the slope, directed upward on the slope, applying hydromulch materials to the entire area. The second pass shall apply 50% of material from the top of the slope, directed downward on the slope, applying hydromulch materials to the entire slope area. Using the color of the mulch as a metering agent, spray the slurry mixture uniformly over the designated seeded area, taking care to avoid 'shadows' and bare spots in the application of the material.
- B. The hydromulch mixtures shall be applied at the following rates:
 1. Wood Cellulose Fiber Mulch application rate: 2,500 lbs./acre
 2. Tackifier application rate: 175 lbs./ac
- C. Apply additional seed in hydromulch slurry mix per acre at an application rate of 10% of drill seed application rate per acre.
- D. Hydro-mulching shall not be done in the presence of surface water. Thoroughly clean site amenities after mulching.

3.07 FERTILIZING

- A. Apply dry organic fertilizer at a rate of 1,200 lbs./ac for all seeded areas for bidding purposes.

3.08 SEED ESTABLISHMENT AND MAINTENANCE

- A. All seeded areas are to be assured of obtaining a satisfactory stand of growth. The total area occupied by bare or dead spots larger than 0.5 square feet must not exceed ten percent (10%) of the total seeded area. Maximum single bare spot size will be one half (1/2) square foot. All seeded grass areas, which do not meet the satisfactory stand of growth qualification, shall be re-seeded and freshly mulched.
- B. Upon acceptance of seeded areas, a 90-day maintenance period will begin. During the maintenance period, the Contractor is responsible for all aspects of establishment and maintenance to ensure vigorous and healthy growth of seeded species. The Contractor will inspect weekly for insect damage, nutrient deficiencies, weeds, and disease and will take corrective action immediately at no additional cost. During the maintenance period, seeded areas will be kept free of weeds that inhibit the growth of the seeded species.
- C. Water the seeded areas during the maintenance period only as necessary to maintain a healthy stand of the seeded species. Over watering will not be accepted. Reduce watering as directed by the Landscape Architect.

D. Protection:

1. The contractor is responsible for the proper care of the seeded areas during the period when the vegetation is being established.
2. Where directed by the Landscape Architect, newly seeded areas shall be protected against traffic or other use, by enclosing the areas with snow fencing or other approved barrier.
3. "NEWLY SEEDED" or other appropriate approved warning placards shall be posted until all work under the contract is completed and accepted.

E. Repair:

1. If at any time before completion and acceptance of the entire work covered by this contract, any portion of the seeded surface becomes damaged, dies due to lack of water, becomes rutted due to improper protection, has been winter-killed or otherwise damaged or destroyed, the affected portion shall be repaired to re-establish the condition and grade of the soil prior to sodding and shall then be reseeded as specified hereinbefore by the contractor, at no additional cost to the Owner.
2. Maintenance during Seed Establishment: Maintenance including watering and cutting of grass shall continue until all seeding work under this contract has been completed and accepted by the Owner.

3.09 NOTIFICATION OF INSPECTION

- A. Notification: Give notice requesting inspection by Landscape Architect at least 7 days prior to the anticipated date of completion. All seed must be alive and healthy in order to be considered complete.
- B. Deficiencies: If deficiencies exist, the Landscape Architect shall specify such deficiencies to the Contractor who shall make satisfactory adjustments and will again notify the Landscape Architect for final inspection.

3.10 CLEANING

- A. Cleaning: Remove pallets, unused sod, and other debris from site. Clean paved and finished surfaces soiled as a result of work under this Section. Remove debris from all drainage inlets and structures.

3.11 PROTECTION

- A. General: Provide and install barriers as required and as directed by Landscape Architect to protect seeded areas against damage from pedestrian and vehicular traffic until acceptance by Landscape Architect.

PART 4 - METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. The work associated with SEED, FERTILIZER and MULCH will be measured by the SQUARE YARD for payment Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the owner for approval.

PART 5 – BASIS OF PAYMENT

5.01 PAYMENT

- A. The work associated with SEED, FERTILIZER AND MULCH shall be included in the Square Yard price bid which includes materials, labor, equipment, transportation, and supervision necessary to complete the installation of items identified herein, and any incidentals necessary for completion of the specified herein as shown on the Contract drawings or as directed by the Engineer.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
329200.01	Seed, Fertilizer and Mulch	Square Yard

END OF SECTION

PART I - DESCRIPTION**I.01 GENERAL**

- A. This work shall be done in accordance with the requirements of Section 816 of the latest MDOT Standard Specifications for Construction except as superseded by the specifications below.

Slope restoration shall consist of furnishing, placing, and fine grading four inches (4) inches of topsoil, seeding, fertilizing, mulching and anchoring of materials to re-establish/establish turf as designated on the plans and specifications,

I.02 WORK NOT INCLUDED

- A. Earthwork and grading, planting trees, shrubs, groundcovers, native seeding and irrigation are not included in this Section.

I.03 QUALITY ASSURANCE

- A. General: Comply with applicable federal, state, county and local regulations governing landscape materials and work.
- B. Employ only experienced personnel familiar with the required work. Provide adequate supervision by qualified foreman.
- C. Substitutions: Substitutions of turf materials are not allowed. If required turf material is not obtainable, submit proof of non-availability to the Landscape Architect, together with proposal for equivalent material.

I.04 DELIVERY, STORAGE, AND HANDLING

- A. Packaged materials: Deliver packaged materials in containers showing weight, analysis, and manufacturer's name. Protect materials from deterioration during delivery and while stored on site.
- B. Seed: Deliver seed to site in original unopened container bearing manufacturer's guaranteed seed analysis, name, trade name, trademark, warranty and conformance to state law. Upon request, submit to Landscape Architect all seed analysis container labels for all seed installed on site.

I.05 PROJECT CONDITIONS

- A. Proceed with and complete restoration work as rapidly as portions of site become available, working with seasonal limitations for each kind of restoration work required.
- B. Coordinate work with other Sections
 - I. Utilities: Determine the location of underground utilities and perform work in a manner to avoid possible damage. Excavate by hand as required. Repair any utilities damaged during sitework to the satisfaction of utility owner at the Contractor’s expense
- C. Planting Time
 - A. For each type of restoration work required, install materials during normal seeding seasons for the project locale,
 - B. Correlate seeding with specified maintenance periods to provide maintenance from date of substantial completion.

PART 2 - PRODUCTS

2.01 QUALITY

- A. All materials used for seeding shall be new and without flaws or defects of any type, and shall be the best of their class and kind.

2.02 SEED MIX

- A. Grass Seed shall be re-cleaned seed of seed crop from the year stipulated in the project specification. All seed shall meet the requirements established by the State and Federal Seed and Weed Control Laws, covering law on “Agricultural Seed.” Seeds shall meet the following requirements in respect to purity and germination.

	Purity %	Pure Live Seed %	Weed Seed %
Seed Variety	Minimum	Minimum	Maximum
Alkaligrass, “Fulfs”	98	85	0.10
Fescue, Creeping Red	75	82	1.00
Fescue, Fine-Leaf	92	85	0.10

	Purity %	Pure Live Seed %	Weed Seed %
Seed Variety	Minimum	Minimum	Maximum
Fescue, Hard	97	85	0.10
Fescue, Red	97	85	0.10

Fescue, Tall	92	88	1.00
Kentucky Bluegrass	75	72	0.50
Redtop	75	78	1.80
Ryegrass, Annual	92	88	0.50
Ryegrass, Perennial	92	88	0.50

- B. The percentage of hard seed included as a part of the germination percentage of any lot of seed, shall not exceed twenty. Kentucky Blue Grass seed shall weigh a minimum of 21 pounds to the measured bushel and for all seeding shall be of the crop year indicated in the project specifications.
- C. Packing and Marking: All seed shall be delivered in sacks unmixed. Seeds shall be packed for delivery in suitable bags in accordance with standard commercial practice. Each bag shall be tagged or labeled as required by the law of the State of Michigan. The vendor’s name shall show on or be attached to each bag, together with a statement signed by the vendor, showing:
 - 1. The kind of seed contained;
 - 2. The percentage of purity and germination;
 - 3. The percentage of hard seed, if any;
 - 4. A statement conforming to the laws of the State of Michigan as herein before mentioned, showing percentage of weed seeds if any.
- D. Grass Seed Mixes: The seed shall be mixed thoroughly in the following proportions, by weight. Where specified varieties are not available, alternative varieties must be approved in writing by the project manager prior to ordering.

General Turf/Athletic Field Grass Seed Mix:

“Appalachian” Kentucky Bluegrass	20%
“Elfkin” Perennial Ryegrass	20%
“Esquire” Perennial Ryegrass	20%
“Fourtuna” Kentucky Bluegrass	20%
“Rugby” M Kentucky Bluegrass	20%

Shade Tolerant Grass Seed Mix:

“Rose” Creeping Red Fescue	30%
“Esquire” Perennial Ryegrass	20%
“Wrigley’s” Chewings Fescue	15%
“Geronimo” Kentucky Bluegrass	15%
“Appalachian” Kentucky Bluegrass	10%

“Ridu” Hard Fescue 10%

Low-Mow Grass Seed Mix:

“Bighorn” Sheeps Fescue 25%
 “Discovery” Hard Fescue 25%
 “Shademaster II” Creeping Red Fescue 25%
 “Tiffany” Chewings Fescue 25%

2.03 WATER

- A. The Contractor will confirm water source prior to beginning construction. Water will be supplied by contractor at no cost to Owner until irrigation system is in full operation at which time Owner will pay for water metered to irrigation system.

2.04 FERTILIZER

- A. Commercial fertilizers may be used to provide the nutrient components specified, or as directed by the Landscape Architect, in order to meet the requirements recommended by soil tests as required under Soil Preparation Section.
- B. Fertilizer shall be designated as appropriate for use in close proximity to lakes and streams.
- C. Commercial fertilizer shall conform to the applicable State fertilizer laws. It shall be uniform in composition, dry, and free flowing, and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Fertilizer, which becomes caked or damaged, will not be accepted.
- D. Organic slow-release fertilizer mix for seed areas.
- E. Organic slow-release fertilizer mix or approved equal for turf lawn areas.
- F. When applied as a topsoil amendment, fertilizer shall have an analysis that will deliver appropriate amounts of nitrogen, phosphorus, and potassium as required to remedy deficiencies revealed by testing of the topsoil.
- G. 50% of nitrogen shall be derived from natural organic sources of ureaform. Available phosphorous shall be derived from superphosphate, bone meal, or tankage. Potassium shall be derived from muriate of potash containing 60% potash.
- H. Fertilizer shall be delivered in manufacturer's standard container printed with manufacturer's name, material weight, and guaranteed analysis.
- I. Fertilizers with N-P-K analysis other than that stated above may be used provided that the application rate per square foot of nitrogen, phosphorous, and potassium is equal to that specified.

2.05 HYDROMULCH

- A. Wood Cellulose Fiber Mulch: Hydromulch material shall consist of virgin wood cellulose fibers

manufactured from clean whole wood chips. Fiber shall not be produced from recycled materials such as sawdust, paper, cardboard, or residue from pulp and paper plants. Fiber shall not contain germination or growth inhibiting factors. It shall be dyed a green color to allow visual metering of its application. Dye shall be biodegradable. The fiber shall be sprayed uniformly on the seeded soil surface, providing a cover that readily absorbs water and infiltration to the soil below. Wood cellulose fibers of mulch must maintain uniform suspension in water under agitation. Suppliers shall be prepared to certify that laboratory and field-testing of their product has been accomplished, and that it meets all of the foregoing requirements.

- I. The wood cellulose fiber mulch shall conform to the following specifications:

Percent moisture content	10.0% +/- 3.0%
Percent Organic Matter*	99.3% +/- 0.2%
Percent Ash Content*	0.7% +/- 0.2%
pH	4.9 +/- 0.5
Water Holding Capacity*	**1200-1600 grams
*Oven-dried Basis	**Per 100 grams of fiber

- 2. Hydro-Mulch: Canfor EcoFibre or approved equal for all seeded areas.

- B. Tackifier: Mulch tackifier shall consist of a free-flowing, noncorrosive powder produced from the natural plant gum of *Plantago insularis* (Desert Indianwheat), applied in a slurry with water and the wood cellulose fiber mulch.

- I. The tackifier shall possess the following properties:

Protein content	1.6% +0.2%
Ash Content	2.7% +0.2%
Fiber	4.0 +0.4%
pH 1% solution	6.5 - 8.0

- 2. Tackifier: Rantec R-Tack Plantago Tackifier or approved equal.

2.06 ANTI EROSION MULCH

I, Mulch blankets consisting of clean, seed free salt hay or threshed straw of wheat, rye, oats or barley, well-seasoned before bailing, free from mature seed – bearing stalks or roots of prohibited or noxious weeds.

PART 3 - EXECUTION

3.01 INSPECTIONS AND REVIEW

- A. Site inspection and review: Verify that existing site conditions are as specified and indicated before beginning work under this section. Verify layout of seeded areas as indicated prior to starting operations. Verify fine grading is complete and accepted by the Landscape Architect and is within +/-0.10 ft. of grades indicated on plans.
- B. Unsatisfactory Conditions: Report in writing to Landscape Architect.

C. Beginning of work in this section implies acceptance of existing conditions by the Contractor.

3.02 CONSTRUCTION REQUIREMENTS

A. Seeding Seasons:

1. Spring Seeding – Spring thaw to May 15th (without irrigation); Spring thaw to June 15th (with irrigation).
2. Fall Seeding – August 30th to consistent ground freeze (without irrigation); August 1 to consistent ground freeze (with irrigation).
3. "Spring thaw" shall be defined as the earliest date in a new calendar year in which seed can be buried 1/2 inch into the surface soil (topsoil) through normal drill seeding methods.
4. "Ground freeze" shall be defined as that time during the fall months in which the surface soil (topsoil), due to freeze conditions, prevents burying the seed 1/2 inch through normal drill seeding operations. Seed shall not be sown, drilled, or planted when the surface soil or topsoil is in a frozen or crusted state.

B. Seeding accomplished outside the time periods listed above will be allowed only when ordered by the Landscape Architect or when the Contractor's request is approved in writing. When requested by the Contractor, the Contractor must agree to perform the following work at no additional cost.

1. Apply the specified seed and mulch at a rate of not less than 25 percent greater per unit area than the rates specified for use within the time periods listed above.
2. Re-seed, re-mulch, and repair areas which fail to produce vegetation.

C. The seeding and the fertilizing application rate shall be as specified. The Landscape Architect may establish seeding test sections to measure seeding rates and to determine if seeding and fertilizing equipment requires adjustment to assure the specified seeding rate.

3.03 SITE PREPARATION

A. Responsibility:

1. Repair or replace any areas or elements damaged by the work of this section including but not limited to: landscape, utilities, fences, and pavements.
2. Identify prepared seed areas requiring protection and shall provide traffic control.

B. Clearing: Prior to any soil preparation, the ground surface shall be cleared of materials, which might hinder final operations. Remove all weeds from proposed seeding areas where topsoil has been placed.

1. Seed Areas: Remove weeds, debris, rubble, rocks and plant material larger than 1 1/2" not scheduled to remain.

- C. Fine Grading: See Section 02310 “Soil Preparation and Fine Grading”
- D. Inspection: Do not lay sod until base preparation and planted depth of trees and shrubs has been inspected and accepted by Landscape Architect.
- E. Coordinate restoration of fine grade to establish the sub-grade at the following depths below design finished grade:

	Adjacent to Curbs & Other Hard Surfaces	Open Areas
a. Seeded areas	1/2"	0" + 1"

3.04 FERTILIZING

- A. Seeded Area Preparation: Spread the following amendments over the entire area to be seeded and incorporate into the top four inches of soil by discing, or rototilling until a uniform mixture is obtained with no pockets of soil or amendments remaining:
 - 1. Organic Compost, Refer to Section 02310 – Soil Preparation.
 - 2. Pre-planting Fertilizer: apply liquid organic fertilizer only to these seeded areas only if soils report indicates the need to add fertilizer for seed areas. Consult Landscape Architect after soil sample tests have been completed to determine need for fertilizer application.
 - 3. Subsequent Applications: do not apply fertilizer after initial seeding.

3.05 SEEDING

- A. Seed within 5 days of completion of accepted soil preparation and/or topsoil placement to prevent weed invasion.
- B. Seed only during the spring or fall seeding season specified.
- C. Complete soil preparation as specified.
- D. Drill seed all areas to be seeded using a mechanical power drawn drill followed by packer wheels or drag chains.
 - 1. Use a range drill seeder capable of handling seed. Mechanical power drawn drills shall have depth bands set to maintain a planting depth of at least .025 to 0.5 inches into the soil and shall be set to space the rows not more than seven inches apart. Seed that is extremely small shall be sowed from a separate hopper adjusted to the proper rate of application. On slopes greater than 4:1 the contractor will broadcast seed on freshly disturbed (raked or harrowed) soil surfaces. Following broadcast seeding the contractor shall immediately rake or harrow the seeds into the surface. Raking shall be accomplished using metal-tined garden or landscape rakes. If harrowing is used, an English harrow or its equivalent shall be used. Seed must be uniformly distributed in the broadcasting device, and seed must be evenly distributed throughout the re-vegetation site.
 - 2. Cover the applied seed with a soil thickness no greater than 0.5 inches in depth.

3. Seeded areas damaged due to circumstances beyond the Contractor's control shall be repaired and re-seeded as ordered. Payment for this corrective work, when ordered, shall be at the contract unit prices.

3.06 HYDROMULCHING - Grass seed mix

- A. Following the installation of seed as specified, hydromulch all seeded areas. Incorporate hydromulch materials and water to form a homogeneous slurry. Slurry shall be applied evenly in a minimum of two (2) passes over the seeded areas. The first pass shall apply 50% of material from the bottom of the slope, directed upward on the slope, applying hydromulch materials to the entire area. The second pass shall apply 50% of material from the top of the slope, directed downward on the slope, applying hydromulch materials to the entire slope area. Using the color of the mulch as a metering agent, spray the slurry mixture uniformly over the designated seeded area, taking care to avoid 'shadows' and bare spots in the application of the material.
- B. The hydromulch mixtures shall be applied at the following rates:
 1. Wood Cellulose Fiber Mulch application rate: 2,500 lbs/acre
 2. Tackifier application rate: 175 lbs/ac
- C. Apply additional seed in hydromulch slurry mix per acre at an application rate of 10% of drill seed application rate per acre.
- D. Hydro-mulching shall not be done in the presence of surface water. Thoroughly clean site amenities after mulching.

3.07 FERTILIZING

- A. Apply dry organic fertilizer at a rate of 1,200 lbs/ac for all seeded areas for bidding purposes.

3.08 SEED ESTABLISHMENT AND MAINTENANCE

- A. All seeded areas are to be assured of obtaining a satisfactory stand of growth. The total area occupied by bare or dead spots larger than 0.5 square feet must not exceed ten percent (10%) of the total seeded area. Maximum single bare spot size will be one half (1/2) square foot. All seeded grass areas, which do not meet the satisfactory stand of growth qualification, shall be re-seeded and freshly mulched.
- B. Upon acceptance of seeded areas, a 90-day maintenance period will begin. During the maintenance period, the Contractor is responsible for all aspects of establishment and maintenance to ensure vigorous and healthy growth of seeded species. The Contractor will inspect weekly for insect damage, nutrient deficiencies, weeds, and disease and will take corrective action immediately at no additional cost. During the maintenance period, seeded areas will be kept free of weeds that inhibit the growth of the seeded species.
- C. Water the seeded areas during the maintenance period only as necessary to maintain a healthy stand of the seeded species. Over watering will not be accepted. Reduce watering as directed by the Landscape Architect.

D. Protection:

1. The contractor is responsible for the proper care of the seeded areas during the period when the vegetation is being established.
2. Where directed by the Landscape Architect, newly seeded areas shall be protected against traffic or other use, by enclosing the areas with snow fencing or other approved barrier.
3. "NEWLY SEEDED" or other appropriate approved warning placards shall be posted until all work under the contract is completed and accepted.

E. Repair:

1. If at any time before completion and acceptance of the entire work covered by this contract, any portion of the seeded surface becomes damaged, dies due to lack of water, becomes rutted due to improper protection, has been winter-killed or otherwise damaged or destroyed, the affected portion shall be repaired to re-establish the condition and grade of the soil prior to sodding and shall then be reseeded as specified hereinbefore by the contractor, at no additional cost to the Owner.
2. Maintenance during Seed Establishment: Maintenance including watering and cutting of grass shall continue until all seeding work under this contract has been completed and accepted by the Owner.

3.09 NOTIFICATION OF INSPECTION

- A. Notification: Give notice requesting inspection by Landscape Architect at least 7 days prior to the anticipated date of completion. All seed must be alive and healthy in order to be considered complete.
- B. Deficiencies: If deficiencies exist, the Landscape Architect shall specify such deficiencies to the Contractor who shall make satisfactory adjustments and will again notify the Landscape Architect for final inspection.

3.10 MULCH BLANKETS

- A. Mulch blankets shall be installed and anchored per MDOT Standards

3.11 CLEANING

- A. Cleaning: Remove pallets, unused sod, and other debris from site. Clean paved and finished surfaces soiled as a result of work under this Section. Remove debris from all drainage inlets and structures.

3.12 PROTECTION

- A. General: Provide and install barriers as required and as directed by Landscape Architect to protect seeded areas against damage from pedestrian and vehicular traffic until acceptance by Landscape Architect.

PART 4 - METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. The work associated with SLOPE RESTORATION will be measured by the SQUARE YARD for payment Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the owner for approval.

PART 5 – BASIS OF PAYMENT

5.01 PAYMENT

- A. The work associated with SLOPE RESTORATION shall be included in the Square Yard price bid which includes materials, labor, equipment, transportation, and supervision necessary to complete the installation of items identified herein, and any incidentals necessary for completion of the specified herein as shown on the Contract drawings or as directed by the Engineer.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
329210.01	Slope Restoration	Square Yard

END OF SECTION

PART I - GENERAL

I.01 WORK INCLUDED

- A. This Section includes the following:
 - I. Installing native seed material as detailed on the Drawings.

I.02 RELATED SECTIONS

- A. Related Sections include the following:
 - 1. Division 1 Section 01 10 00 "Summary" for a description of project scope of work.
 - 2. Division 2 Section 02 51 00 "Excavation, Backfilling and Compaction" for associated excavation, fill, overall site grading, and topsoil placement.
 - 3. Division 31, Section 31 25 00 "Erosion and Sedimentation Controls" for subsequent installation of erosion control measures and blankets over seeded areas.

I.03 REFERENCES (Not used).

I.04 SUBMITTALS

- A. All plant material shall be true to species and shall originate from the same EPA Level III as the site Ecoregion or an adjacent EPA Level III Ecoregion.
- B. All species substitutions must be approved by the ENGINEER.
- C. All seed shall be PLS (Pure Live Seed) tested to ensure seed is of high quality. Seed quantities shall be adjusted to ensure a minimum of 85% PLS, according to the test results. CONTRACTOR shall provide PLS test results and a copy of the seed bag label at the request of the ENGINEER.

I.05 QUALITY ASSURANCE

- A. Seeding shall be performed by a qualified contractor experienced in this type of work.
- B. CONTRACTOR shall provide an on-site supervisor experienced in native plant seeding with a minimum 4-year degree in natural resources, biology, or related field.
- C. Any and all work not completed to this specification shall be corrected by the CONTRACTOR at no additional cost to the OWNER.
- D. Seeded areas shall have at least 80% ground cover of seeded species (including cover crop) by October 1, 2021. The ENGINEER shall have the sole responsibility for determining if sufficient ground cover exists after one full growing season.

E. If the requirement of 1.5 (D) is not satisfied, the CONTRACTOR shall provide all equipment, labor, and materials necessary to reseed the deficient areas to be in conformance with 80 percent ground cover at no additional cost to the OWNER.

PART 2 - PRODUCTS

2.01 SPECIES

A. Plant species and approximate quantities shall be as listed below. An approximate acreage breakdown by planting area is included on Drawings for reference, but actual amounts may be altered according to actual site conditions. BIDDER will enter a per-acre cost on bid sheet.

Harwood-Conifer Swamp Understory Seed Mix

Scientific Name	Common Name	PLS Oz Per Acre
<i>Asclepias incarnata</i>	Swamp milkweed	4
<i>Bidens cernua</i>	Nodding beggar ticks	1
<i>Bidens frondosa</i>	Common beggar ticks	1
<i>Bromus ciliatus</i>	Fringed brome	8
<i>Calamagrostis canadensis</i>	Blue-joint	1
<i>Carex crinita</i>	Fringed sedge	4
<i>Carex hystericina</i>	Porcupine sedge	2
<i>Carex lacustris</i>	Common lake sedge	1
<i>Carex stricta</i>	Common tussock sedge	3
<i>Carex vulpinoidea</i>	Brown fox sedge	3
<i>Cinna arundinacea</i>	Wood reedgrass/ common wood reed	3
<i>Eleocharis palustris</i>	Great spike rush	1
<i>Elymus virginicus</i>	Virginia wild rye	48
<i>Epilobium coloratum</i>	Cinnamon willow herb	1
<i>Eupatorium perfoliatum</i>	Common boneset	1
<i>Glyceria striata</i>	Fowl manna grass	4

<i>Iris virginica</i>	Southern blue flag/ blue flag iris	1
<i>Leersia oryzoides</i>	Cut grass/ rice cut grass	1
<i>Lobelia cardinalis</i>	Red lobelia/ cardinal flower	0.5
<i>Lobelia siphilitica</i>	Great blue lobelia	0.5
<i>Scirpus atrovirens</i>	Dark green rush	3
<i>Sium suave</i>	Tall water parsnip	0.5
<i>Solidago patula</i>	Swamp goldenrod/ roough-leaved goldenrod	1
<i>Solidago rugosa</i>	Rough goldenrod	0.5
<i>Symphotrichum lanceolatum</i>	Panicled aster	1
<i>Symphotrichum lateriflorum</i>	Calico aster/ side-flowering aster	1
<i>Symphotrichum puniceum</i>	Swamp aster/ bristly aster	1
<i>Thalictrum dasycarpum</i>	Purple meadow rue	1
<i>Verbena hastata</i>	Blue vervain	2
	Total PLS Ounces Per Acre	100.00
	Total PLS Pounds Per Acre	6.25
<i>Avena sativa</i>	Seed oats	512
<i>Lolium multiflorum</i>	Annual rye	160

PART 3 - EXECUTION

3.01 TIMING

- A. Seed for this project shall be installed immediately following earthwork and prior to placement of erosion control fabric, unless otherwise approved by the ENGINEER.

3.02 METHODS

- A. Seed shall be installed utilizing one of the following methods:
1. Seed shall be installed by hand broadcasting or by utilizing a no-till native seed drill (Truax, Tye, Great Plains, or approved equal) OR a native drop seeder (Truax Trillion seeder). Only seeding equipment manufactured for native seed installation shall be utilized. Seed shall not be placed more than 1/8 inch into the soil.
 2. In areas too wet or too small to seed with machinery, seed shall be hand-broadcast by incorporating seed into wet soil clumps and distributing throughout target area. The

ENGINEER must approve use of this technique prior to implementation and must be present at the start of implementation to ensure proper execution.

3. Seed shall not be installed via hydroseeding equipment under any circumstances.

3.03 SOIL PREPARATION AND FERTILIZER

- A. See Section 31 23 00 for soil preparation details.
- B. No fertilizer shall be required.
- C. No mulch shall be required.

3.04 EROSION CONTROLS

- A. Seed shall either be covered with erosion control blanket or blown and crimped straw mulch following installation, per Section 31 25 00

PART 4 - METHOD OF MEASUREMENT

4.01 SHORELINE SEED

- A. The Shoreline Seed will be measured by Square Foot.

PART 5 - BASIS OF PAYMENT

5.01 SHORELINE SEED

The basis of payment shall be as noted below for the SHORELINE SEED, shall be included in the Square Foot price bid which includes materials, labor, equipment, transportation, and supervision necessary to complete the installation of items identified herein, and any incidentals necessary for completion of the specified herein as shown on the Contract drawings or as directed by the Engineer.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
329220.01	SHORELINE SEED	Square Foot

END OF SECTION

PLANT MATERIALS

SECTION 32 93 00

PART I - GENERAL**I.01 RELATED DOCUMENTS**

- A. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section including, but not limited to, all Drawings, all Specifications, General Conditions, and General Requirements including submittals.

I.02 DESCRIPTION OF WORK

- A. The work of this Section consists of:
 - 1. Furnish and Install shade trees, evergreen trees, ornamental shrubs, perennials; placement of planting, mulch, and warranty of plantings.
 - 2. Maintenance of the following: Trees, Shrubs & other Plant Materials, Lawn.
 - 3. Furnish and install native seed material as detailed on the drawings.

I.03 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum laced as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of exterior plant required.
- D. Clump: Where three or more young trees were planted in a group and have grown together as a single tree having three or more main stems or trunks.
- E. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. The container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of exterior plant required.
- F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted exterior plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of exterior plant.

- G. Finish Grade: Elevation of finished surface.
- H. Landscape Maintenance: All work and materials necessary to establish the landscape from the time of transplanting, planting, seeding and/or sodding. Maintenance shall include existing plants retained but not include any cleaning or rectification work necessary due to defects under this contract or damage by others due to inadequate protection required by this contract.
- I. Maintenance Period: Contract period starting at the time of planting and running until end of Warranty Period.
- J. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- K. Multi-Stem: Where three or more main stems arise from the ground from a single root crown or at a point right above the root crown.
- L. Planting Soil: Native or imported topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- M. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.
- N. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.
- O. Tip pruning: remove growing tips of plants at any time of year other than flowering period.
- P. Light pruning: remove growing tips and immature woody growth after flower and fruiting for evergreen plants or during dormant period for deciduous plants.
- Q. Hard pruning: remove growing tips, immature wood and mature wood late winter or early spring.
- R. Weed: Any plant or viable reproductive part of a plant that is not on the Plant Schedule.

I.04 QUALITY ASSURANCE

- A. Certificates:
 - 1. Submit certificates of inspection required by law for transportation of each shipment of plants along with invoice.
 - 2. File copies of certificates after acceptance of material. Inspection by Federal or State Governments at place of growth does not preclude rejection of plants at project site.
- B. Applicable Standards: Apply standards for plant materials as described in the following:
 - 1. "American Standard for Nursery Stock," Latest Edition, American Association of Nurserymen, Inc.

2. Hortus III - 1976 Edition, Bailey Horatorium, Cornell University.
- C. Installer Qualifications: A qualified landscape installer whose work has resulted in the successful establishment of exterior plants will submit the following qualifications in writing.
1. At least five (5) years of continuous business experience installing high quality plantings.
 2. The ability to procure all the plant materials specified for this project. All plants will be procured from nurseries located in USDA Zone 6a or colder areas and all plants will be of the species, size, and quality listed on the Plant List and specified herein.
 3. Ownership of equipment required to perform the services shown on the Drawings and specified herein.
 4. A qualified project foreman and landscape laborers that have performed similar services over a five (5) year period.
 5. Installer's Field Supervision: Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.
- D. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- E. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
1. Report suitability of topsoil for plant growth. State-recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.
- F. Restoration of damaged areas: All products supplied shall comply with applicable state and local codes.
1. Inspections and Approvals: During the course of the restoration work, coordinate the following inspections and secure approvals prior to continuing on to the next work component, as applicable. For lawn area and/or shrub bed restoration, the Landscape Architect shall inspect and approve sub-grade preparation, soil placement and preparation, seeding/sodding and planting/mulching.
- G. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."
- H. Selection of exterior plants purchased under allowances will be made by Landscape Architect, who will review plant materials at source or by photographs before they are prepared for transplanting.
- I. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above the ground for trees up to 4-inch caliper size, and 12 inches above the ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

- J. Observation: Landscape Architect may observe trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Landscape Architect retains the right to observe trees and shrubs further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
 - I. Notify Landscape Architect of sources of planting materials 21 days in advance of delivery to site.
- K. Pre-installation Conference: Conduct conference at Project Site.
- L. Performance Requirement: Be responsible for all procedures necessary to maintain the plants in a state of continuing healthy growth and in optimum physical and aesthetic condition. Use preventative and corrective maintenance procedures to ensure that living landscape materials:
 - I. Are strong, vigorous and stable.
 - 2. Have foliage of normal size, shade, density and color.
 - 3. Have deep symmetrical/radial, well-branched fibrous roots.
 - 4. Are tolerant of irregular watering and water stress.
 - 5. Have low susceptibility to pests and diseases.
 - 6. Are resistant to weed invasion and establishment.
 - 7. Are stable in strong winds.
 - 8. Are without nutritional deficiencies and toxicity.
 - 9. Reuse other landscape waste.
- M. Native Seed
 - I. Seeding shall be performed by a qualified contractor experienced in this type of work.
 - 2. CONTRACTOR shall provide an on-site supervisor experienced in native plant seeding with a minimum 4-year degree in natural resources, biology, or related field.
 - 3. Any and all work not completed to this specification shall be corrected by the CONTRACTOR at no additional cost to the OWNER.
 - 4. Seeded areas shall have at least 80% ground cover of seeded species (including cover crop) by October 1, 2026. The ENGINEER shall have the sole responsibility for determining if sufficient ground cover exists after one full growing season.

5. If the requirement of I.03, M (4) is not satisfied, the CONTRACTOR shall provide all equipment, labor, and materials necessary to reseed the deficient areas to be in conformance with 80 percent ground cover at no additional cost to the OWNER.

I.05 PROJECT CONDITIONS

A. Protection of Existing Plants to Remain:

1. Operations: Do not store materials or equipment, permit burning, or operate or park equipment under the branches of all existing plants to remain.
2. Barriers: Confirm that all tree protection fencing has been installed.
3. Notification: Give written notification if other construction activities threaten to damage existing plants to remain.

B. Replacement of Damaged Plants:

1. Replace existing plants to remain, which are damaged during construction with accepted plants of the same species and size as those damaged at no cost to Owner.
2. Project Architect will determine the extent of damage and value of damaged plants.

C. Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance until the date of Substantial Completion. Any replacement planting shall also occur within the following periods:

Herbaceous Plants:

Where Irrigated: April 15 - October 15

Non-Irrigated April 15 - June 15 September 15 - October 15

Woody Plants:

Where irrigated: March 15 - November 30

Non-Irrigated: March 15 - June 30 October 1 - November 30

D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed according to manufacturer's written instructions and warranty requirements.

E. Lawn / Planting Area Restoration: The Landscape Architect shall determine the level of restoration necessary depending on the amount of damage to the existing planting areas and soils. Areas that have been driven on extensively and are compacted or bare will require replacement, whereas areas where turf is thinned or dead but still present will require reseeding only.

- F. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns unless otherwise acceptable to Landscape Architect.
 - I. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

I.06 WORK SCHEDULE

- A. Proceed with the work as rapidly as the site becomes available, consistent with normal seasonal limitations for planting work.

I.07 SELECTION, REVIEW AND ORDERING OF PLANT MATERIAL

- A. General: All plant materials shall be reviewed at the source or by photograph by the Landscape Architect, prior to delivery on site. The Contractor shall notify the Landscape Architect when all (or most) of the plant materials are available for inspection. Trees damaged in shipment may be rejected upon delivery.
- B. Documentation: Submit documentation within 10 days after award of Contract that all plant materials have been ordered. Arrange procedure for review of plant materials at time of submission.
- C. Transportation: Contractor shall accompany Landscape Architect to all review(s) of plant materials at the nursery. The Landscape Architect will review and tag plants at place of growth and upon delivery for conformity to specifications. The Contractor is responsible for all travel costs of Landscape Architect.
- D. Distant Material: Submit photographs with a person and a measurement stick with clearly marked lengths, adjacent to plants for preliminary review. Such reviews shall not supersede the right of rejection at the project site.
- E. Unavailable Material: If written proof is submitted that any plant specified is not available, the Contractor may submit a proposal to use the nearest equivalent size or variety with corresponding adjustment of Contract price. Substitutions will only be considered after Contractor has exhausted all procurement options, including local and distant nurseries and plant brokers. Substitutions require the approval of the Landscape Architect.
- F. Special Conditions: The above provisions shall not relieve Contractor of the responsibility of obtaining specified materials in advance if special growing conditions or other arrangements must be made in order to supply specified materials.

I.08 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Labeling: Furnish standard plants bearing original labels legibly genus/species and name of grower.
- B. Storage: Store plant materials in fully equipped nursery yards. Ball and burlap rootballs will be placed in wood mulch and completely covered. Container plants will be protected from sunscald. All plants will be watered daily by means of an automatic irrigation system. Trees and

shrubs will be arranged so as not to crowd the branches, allowing for the natural growth of the plant.

- C. Deliver exterior plants freshly dug.
 - I. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.
- D. Handling: Do not lift or handle container plants by tops, stems or trunks at any time. Do not bind or handle plants with wire or rope at any time. Handle B&B plant stock by root ball only.
- E. Anti-Desiccant: At Contractor's option, spray all evergreen or deciduous plant material in full leaf immediately before transporting with anti-desiccant. Apply an adequate film over trunks, branches, twigs and foliage.
- F. Digging: Dig ball and burlap plants with firm, natural balls of earth of diameter not less than that recommended by USDA Standard for Nursery Stock, and of sufficient depth to include the fibrous and feeding roots.
- G. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery and handling.
- H. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants and trees in shade, protect from weather and mechanical damage, and keep roots moist.
- I. Heel-in bare-root stock. Soak roots that are in dry condition in water for two hours. Reject dried-out plants.
- J. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
- K. Do not remove container-grown stock from containers before the time of planting.
- L. Water root systems of exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

I.09 MAINTENANCE PERIOD AND FINAL ACCEPTANCE

- A. Maintain installed trees, shrubs, perennials and vines for a period of two (2) years following Substantial Completion per the requirements of this section.

I.10 WARRANTY PERIOD

- A. Warranty Period: All plants will be warranted for two (2) years following the date of Substantial Completion. At the Landscape Architect's discretion, portions of the work will be accepted prior to completion of the entire project.

- B. Warranties:
 - 1. Correct Species: Warrant that all plant materials are true to species and variety. Substitutions will only be accepted in writing prior to delivery to site. Plants on site that do not meet the requirements of Drawings and specifications as determined by the Landscape Architect will be removed and replaced at no cost to the Owner.
 - 2. Vigor: Warrant that all trees, shrubs planted under this Contract will be healthy and in flourishing condition at the completion of Warranty Period.
- C. Delays: All delays that extend the planting into more than one planting season shall extend the Warranty Period correspondingly.
- D. Condition of Plants: Plants shall be free of dead or dying branches and branch tips, with all foliage of a normal density, size and color.
- E. Replacements: As soon as weather conditions permit, and only during approved planting seasons, replace, without cost to Owner, all dead plants and all plants not in a vigorous, thriving condition, as determined by Landscape Architect during and at the end of Warranty Period.
- F. Exclusions. The Contractor shall not be held responsible for failures due to vandalism during Warranty Period. Report such conditions to The Landscape Architect.

I.II REPLACEMENTS

- A. Warranty: For the period between the time of Substantial Completion of planting and the end of the warranty, the Contractor is responsible for up to (2) replacements per plant. Plants that require replacement will be any new or transplanted plant material that is dead, or that is, in the opinion of the Landscape Architect, in unhealthy or unsightly condition. Including plants that have lost their natural shape, or that have been damaged beyond repair due, in the judgment of the Landscape Architect, to inadequate maintenance and/or protection from animal damage or the natural elements.
- B. Failed Materials:
 - 1. Plant materials exhibiting conditions, which are determined as being unacceptable due to workmanship by the Contractor, shall be repaired and/or replaced at no additional cost to the Owner as determined by the Landscape Architect.
 - 2. Closely match replacements to adjacent specimens of the same species.
- C. Incorrect Materials:
 - 1. During Warranty Period, replace at no cost to Owner all plants revealed as being untrue to name.
 - 2. Provide replacements of a size and quality to match the planted materials at the time the mistake is discovered.

I.12 SUBMITTALS

- A. Submit the following to Landscape Architect for approval prior to delivery to site. Attach product name, address of manufacturer and/or supplier to each sample.
1. Tree and Shrub Time-Release Fertilizer Tablet or Packet: one sample, manufacturer's description and testing results.
 2. Stakes, Anchors, Brace Strap, Clamps, Turnbuckles and Guy Wires for Trees: one sample of each.
 3. Mulch: one quart sample with product name, product analysis, manufacturer, and manufacturer's address.
 4. Humus Mulch: One-quart sample and manufacturer's analysis.
 5. Anti-desiccant: manufacturer's product literature.
 6. Tree ordering and Substitution: submit full plant substitution list indicating scientific name of specified tree, scientific name of substitution tree, and substitution nursery name, address, and contact person for approval prior to ordering plants. Substitutions will be carefully reviewed by Landscape Architect. The Contractor will be required to present documentation of researching all reasonable sources for supplying the specified plants prior to the acceptance of substitutions.
 7. Qualification Data: For qualified landscape Installer.
 8. Material Test Reports: For existing surface soil and imported topsoil.
 9. Planting Schedule: Indicating anticipated planting dates for exterior plants.
 10. Maintenance Instructions: Recommended procedures to be established by the Owner for maintenance of exterior plants during a calendar year. Submit before expiration of required maintenance periods.
 11. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 - a. Manufacturer's certified analysis for standard products.
 - b. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
 12. Backfill Mix: 1 quart sample
 13. Native Seed
 - a. All plant material shall be true to species and shall originate from the same EPA Level III as the site Ecoregion or an adjacent EPA Level III Ecoregion.

- b. All species substitutions must be approved by the ENGINEER.
- c. All seed shall be PLS (Pure Live Seed) tested to ensure seed is of high quality. Seed quantities shall be adjusted to ensure a minimum of 85% PLS, according to the test results. CONTRACTOR shall provide PLS test results and a copy of the seed bag label at the request of the ENGINEER.

PART 2 - PRODUCTS

2.01 PLANT MATERIALS

- A. General: Verify that all container stock has been grown in the containers in which delivered for at least 2 months, but not over 2 years for shrubs or 2 years for perennials and groundcovers. Do not install container plants that have cracked or broken balls of earth when taken from container.
 1. Growing Conditions: Plants shall be nursery-grown in accordance with good horticultural practices under climatic conditions similar to those of the project for at least two years unless otherwise specifically authorized.
 2. Appearance: Superior in form for their species, with regard to number of branches, compactness and symmetry.
 3. Vigor: Plants shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs, or larvae. They shall have healthy, well-developed root systems. Plants shall be free from physical damage or adverse conditions which would prevent thriving growth.
- B. Condition of Root System: Samples must prove to be completely free of circling, kinked or girdling trunk surface and center roots and show no evidence of a root-bound condition.
- C. Measurements:
 1. General: Measure plants when branches are in their normal upright position. Height and spread dimensions specified refer to main body of plant and not branch tip to tip. Take caliper measurement at a point on the trunk 6 in. above the natural ground line for trees up to 4 in. in caliper and at a point 12 in. above the natural ground line for trees over 4 in. in caliper.
 2. Size Range: If a range of size is given, do not use plant materials less than the minimum size. The measurements specified are the minimum size acceptable and are the measurements after pruning, where pruning is required. Plants that meet the measurements specified, but do not possess a normal balance between height and spread shall be rejected.

3. Substitutions: Substituted plants shall be true to species and variety and shall conform to measurements specified except that plants larger than specified may be used if accepted. Use of such plants shall not increase Contract price. If larger plants are accepted, increase the rootball size in proportion to the size of the plant.

D. Pruning: Do not prune plants before delivery.

E. Condition: Trees, which have damaged or crooked leaders, will be rejected. Trees having a main leader shall not have been headed back. Trees with abrasions of the bark, sunscalds, disfiguring knots, or fresh cuts of limbs over 3/4 in. which have not completely callused, will be rejected.

2.02 PLANTING BACKFILL MIX FOR PLANT PITS AND PLANT BEDS

A. Backfill Mix: Backfill mix shall consist of one-part sterilized cow manure, one part pulverized peat moss, and four parts of specified topsoil. Thoroughly mix all ingredients prior to installation in planting pits and vaults.

2.03 COMMERCIAL FERTILIZERS

A. Tree and Shrub Fertilizer Tablets: Complete fertilizer, 50 percent of the nitrogen to be derived from natural organic sources or urea-form. Available phosphoric acid shall be from superphosphate, bone or tankage. Potash shall be derived from muriate of potash containing 60 percent potash:

20% Nitrogen

10% Phosphoric Acid

5% Potash

2.04 STAKING MATERIALS

A. Tree Stakes: Stakes shall be sound wood of uniform size, reasonably free of knots and capable of performing their function for at least two (2) years. Tree support stakes shall be 3-inch diameter debarked cedar or 2 inch x 2 inch hardwood posts 9 feet long.

B. Tree straps shall be 12" x 1 1/2" nylon weave with a 3/4" grommet at each end. Submit sample for approval.

C. Guy wire: 2-strand pliable zinc-coated, 12-gauge steel wire minimum.

2.05 GUYING MATERIALS

A. Hardware:

1. Tree straps shall be 12" x 1 1/2" nylon weave with a 3/4" grommet at each end. Submit sample for approval.

2. Guy wire: 2-strand pliable zinc-coated, 12-gauge steel wire minimum.

3. Turnbuckles: Galvanized or zinc plated and weldless.
4. Cable Clamps: Galvanized size as required.
5. Protection Collars: 3/8 in. diameter x 30" long white PVC. Provide for all guyed installations as directed by Landscape Architect.
6. Visible flagging connected to guy wires: orange plastic tape tied to guy wires for duration of guying period.

2.06 WATER

- A. Clean, fresh and potable, furnished and paid for by Contractor.

2.07 PLANTING MULCH

- A. Tree and Shrub Mulch shall be processed shredded hardwood bark only, not to exceed 2" in size, as approved by the Landscape Architect. Mulch shall be placed to the depth shown and as directed and approved. Sample of mulch shall be submitted to the Landscape Architect, before starting work. Bark mulch shall be composted for a minimum of one year to lessen the buildup of heat. Contractor to furnish and install mulch for all plantings completed under this contract.
 - I. Mulch for trees and shrub plantings will be a 3" coverage of Premium Hardwood Bark Mulch as approved by the Owner/Professional
- B. Perennials and vines will be mulched with a 2" thickness of pine bark and compost, individual pieces not to exceed 1" in size, as approved by the Landscape Architect. Mulch shall be placed to the depth shown and as directed and approved. Sample of mulch shall be submitted to the Landscape Architect, before starting work. Bark mulch shall be composted for a minimum of one year to lessen the buildup of heat. Contractor to furnish and install mulch for all plantings completed under this contract.
 - I. Perennials will be mulched with pine bark and compost such as "One Step Mulch and Soil Conditioner" as approved by the Owner/Professional.

2.08 ANTI-DESICCANT

- A. Type: Anti-desiccants for retarding excessive loss of plant moisture and inhibiting wilt shall be sprayable, water insoluble beta-pinene polymer which will produce a moisture retarding barrier not removable by rain or snow.

2.09 TREE WRAP

- A. First quality 4 inch wide, bituminous impregnated, corrugated, with a minimum 25% stretch factor. Duct tape of any type is prohibited.

2.10 WATERPROOF MEMBRANE

- A. Trees planted on pier to have waterproof membrane wrap around sides of tree pit prior to placing rootball. Bottom of tree pit to be left unwrapped, with filter fabric only.

PART 3 - EXECUTION

3.01 PRE-PLANTING REVIEW

- A. General: Do not commence planting work without written acceptance by Landscape Architect of Soil Preparation and Fine Grading, Section 02310.
- B. Finish Grades shall have been established in accordance with Fine Grading Section. Verify that all grades are within 1 in. plus or minus of required finish grade and that all soil amendments and topsoil have been installed. Fine rake planting beds prior to planting shrubs. The Landscape Architect will inspect the site prior to planting and direct grading and soil preparation adjustments as necessary prior to planting.
- C. Notification: Submit written notification of all conditions inconsistent with specifications for soil preparation and mixing.
- D. Surface Drainage: Maintain 2% minimum slope for drainage in planted areas as shown on grading plans except for wetlands planting area.
- E. Discrepancies: Submit in writing, all discrepancies in the Drawings or Specifications, obstructions on the site, or prior work done by others, which Contractor feels precludes maintaining proper drainage; include description of all work required for correction or relief of said discrepancies.
- F. Detrimental Drainage, Soils and Obstructions:
 - 1. Notification: Supply written notification of all conditions detrimental to growth of plant material. State condition and submit proposal and cost estimate for correcting condition.
 - 2. Testing: Where heavy clay is present, test drainage of plant beds and pits by filling with water twice in succession. Give written notification of conditions permitting the retention of water in planting beds for more than twenty-four (24) hours.
 - 3. Correction: Submit for acceptance a written proposal and cost estimate for the correction of poor drainage conditions before proceeding with work.
 - 4. Obstructions: If rock, underground construction work, tree roots or other obstructions are encountered in the excavation of plant pits, alternate locations may be used as directed by Landscape Architect. Where locations cannot be changed, submit the cost required to remove the obstructions to a depth of not less than 6 in. below the required pit depth. Proceed with work after acceptance.

3.02 LAYOUT AND EXCAVATION OF PLANTING AREAS

- A. Layout and Staking: At least 7 days prior to proposed planting, the Contractor will stake the location of proposed trees and the edges of proposed shrub masses for approval by the Landscape Architect. Mark tree locations with wood stakes that are labeled with each tree species abbreviation, per the Planting Plan.
- B. Review: Landscape Architect will review layout, direct adjustments, and approve all tree and shrub locations before planting begins.
- C. Equipment for Digging Plant Pits: Use of a vernier spade to dig plant pits is prohibited. Auger is acceptable with scarification of the pits during augering. Backhoe is acceptable, with scarification of the tree pit during excavation.

3.03 PLANTING OPERATIONS

- A. General:
 - 1. Store delivered plants on site only in locations approved by the Landscape Architect. Stored plants will be mulched in and watered every day. No plants will be stored, on or off site, between November 30th and March 1st.
 - 2. Protect plants at all times from the sun or drying winds.
 - 3. Stand all stored trees upright and support in place.
 - 4. Keep plants that cannot be planted immediately upon delivery in the shade, well-protected, and well-watered.
 - 5. Heel in and protect with burlap all B&B plant materials, which cannot be planted upon delivery.
- B. Handling and De-potting of Plant Materials:
 - 1. Avoid all damage to containers and rootballs. If rootball is cracked or broken during handling, plant will be rejected.
 - 2. Container Grown Plant Material: remove plant from container tease tangled or circling roots out from rootball prior to placement in planting pit.
 - 3. Balled and Burlap Plants: Lift and carry by bottom of ball only. Do not remove wrapping until plant is set in plant pit. Cut and completely remove metal basket and tie wire. Remove twine and burlap from upper 1/2 of rootball prior to backfilling.
- C. Installation:
 - 1. Plant Pit: Excavate deep enough to accommodate the ball and bed of prepared back fill mix. Compact before setting of plants. Scarify sides of plant pit, thoroughly breaking up all surfaces and eliminating all "glazed" areas.

2. Positioning: Backfill plant pit as required to allow setting crown of trees 4 inches above surrounding finish grade. Thoroughly foot tamp all backfill placed under the rootball. Position plant in planting pit while maintaining plumb condition.
3. Backfilling:
 - a. Use backfill mix as specified herein. Brace each plant plumb and rigidly in position until planting soil has been tamped solidly around the ball and roots.
 - b. When plant pits have been backfilled approximately 2/3 full, water thoroughly and saturate rootball, before installing the remainder of the backfill mix to top of pit, eliminating all air pockets.
4. Fertilizer Tablets: Place evenly distributed in plant pits when backfilled 2/3 according to the following schedule:
 - a. Container stock:

	# of Tablets
1 gallon cans	2 tablets
5 gallon cans	4 tablets
15 gallon cans	6 tablets
 - b. B & B stock:

1 tablet per in. caliper OR 1 ft. of height, whichever is less
- D. Adjustment: Adjust trees and shrubs so that after full settlement has occurred, the grade at the base of the trees is 4 in. above the adjacent planting finish grade and the grade at the base of the shrubs is 1 in. above the adjacent planting finish grade.
- E. Hand water trees and shrubs daily until plants are established per the Landscape Architect.
- F. Watering Basin: Form saucer with 3 in. high, 3' diameter berm centered around tree pits at least.
- G. Watering: Thoroughly water all plants immediately after completion of planting operations to ensure good soil to root contact and minimize air pockets.
- H. Labels: Remove all nursery-type plant labels from plants.
- I. Pruning
 1. All pruning is to be performed by Certified Arborists only.
 2. Required height and spread sizes must be met after pruning is performed.

3. Trees and shrubs are to be pruned as necessary to remove dead and/or injured twigs, branches and limbs. Pruning shall be done in such a manner as not to change the natural shape or habit of the plants.
4. Pruning shall be done with clean, sharp hand pruners or pruning saws. The use of hatchets, axes, shovels or other implements not specifically designed for pruning is prohibited.
5. All cuts shall be made so as to produce a small collar but leave no stubs. Cuts shall be made in such a manner as to preclude the tearing, stripping or other damage to adjacent bark, limbs or branches.

3.04 STAKING AND GUYING

A. General:

1. Staking of deciduous trees and guying of evergreen trees is required under all conditions unless otherwise approved by Landscape Architect.

B. Staking:

1. Trees that require staking will be staked as follows.
 - a. Locate stakes in line with the trunk of tree, due west and east of the trunk and between 2 and 6 inches of the outside of the rootball. Drive stakes at least 30 in. into firm ground.
 - b. Bracing straps shall be placed around the trunk in a single loop. Run cable through grommets on support clamp, fasten turnbuckle, clamp, fasten cable to strap and around stake, fasten with clamp and tighten turnbuckles.

C. Guying above grade:

1. Guy trees at points of branching, with guys spaced equally around and outside perimeter of ball.
2. Guys: Provide one turnbuckle for each guy. Use 2 cable clamps at each cable connection. Place white PVC pipe as the guy covers on all guys.
3. Attach flags to each guy wire, 30 inches above finish grade.

D. Tree Wrap: Apply tree wrap in the fall season after being planted and remove wrap in the spring as noted in Section 02970.

3.05 MULCHING

- A. Install a 3-inch-deep layer (as measured after settlement) of specified mulch over all tree pits (including tree watering basins) and over shrub rootballs.
- B. Install a 2-inch-deep layer of specified mulch in perennial and vine beds only.

3.06 WOODY PLANT MATERIAL

- A. Place mulch around each planted shrub or tree to protect from competition and to moderate soil temperatures.
- B. For optimal survival, transplant trees in early spring while they are dormant. Avoid transplanting trees in summer.
- C. If predation from beavers or deer is a concern, place each tree or shrub in a protective cage.

3.07 NATIVE SEED METHODS

- A. Seed for this project shall be installed immediately following earthwork, unless otherwise approved by the ENGINEER.
- B. Seed shall be installed utilizing one of the following methods:
 - 1. Seed shall be installed by hand broadcasting or by utilizing a no-till native seed drill (Truax, Tye, Great Plains, or approved equal) OR a native drop seeder (Truax Trillion seeder). Only seeding equipment manufactured for native seed installation shall be utilized. Seed shall not be placed more than 1/8 inch into the soil.
 - 2. In areas too wet or too small to seed with machinery, seed shall be hand-broadcast by incorporating seed into wet soil clumps and distributing throughout target area. The ENGINEER must approve use of this technique prior to implementation and must be present at the start of implementation to ensure proper execution.
 - 3. Seed shall not be installed via hydroseeding equipment under any circumstances.
- C. Soil Preparation and Erosion Control for Native Seed
 - 1. No fertilizer shall be required.
 - 2. No mulch shall be required.
 - 3. Seed shall either be covered with erosion control blanket or blown and crimped straw mulch following installation.

3.08 MAINTENANCE AND MONITORING

- A. All plants installed under this contract will be maintained until the end of the Warranty Period. Payment for the maintenance will not be made separately. Maintenance includes but is not limited to watering, weeding, pruning, removal and replacement, and the application of herbicides and insecticides. Only qualified, trained personnel possessing a valid Applicators License will be allowed to apply herbicides and pesticides

- B. Weed Control is critical for the success of shrubs and trees in seeded areas. Efforts should be focused on noxious weeds as these species are the most difficult to control. The sooner control methods are started, the easier to control or eliminate a species; otherwise the infestation may be impossible to control. If noxious weeds are found at a site before grading, pre-treat the site with an approved herbicide until the weeds have been eliminated. After planting, carefully monitor the site and if noxious weeds occur, control the weeds using an Integrated Weed Management Plan targeted for the specific species. An Integrated Weed Management Plan combines several methods (mechanical, biological, and herbicides) in the most effective and least environmentally damaging way to control a species.
- C. Continually check for erosion and repair the eroded area as soon as possible to prevent greater damage.
- D. Tree and Shrub Maintenance: Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, adjusting and repairing stakes and guy supports and root-ball stabilization, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings.
- E. Ground Cover and Plant Maintenance: Maintain and establish plantings by watering, weeding, fertilizing, mulching, and other operations as required to establish healthy, viable plantings.
- F. Staking and guying removal: Remove above grade tree staking and guying at end of warranty period.

3.08 OTHER SITE FEATURES

- A. All other site features either damaged or destroyed during the execution of this contract shall be repaired to the satisfaction of the Engineer or to the installation specifications of the manufacturer of the approved replacement item. These include but are not limited to walls, sidewalks, curbs, stairways, wood decking, driveways, etc.

3.09 FINAL COMPLETION

- A. Acceptance: Work shall be accepted by the Landscape Architect upon substantial completion of the Work, including Maintenance Period, but exclusive of replacement of materials under the Warranty Period. Submit a written request to the Landscape Architect for review for Final Completion at least 21 working days prior to anticipated Final Review date, which is after the end of the Maintenance Period.
- B. Corrective Work: Work requiring corrective action or replacement in the judgement of the Landscape Architect shall be performed within ten calendar days after the Final Review and the Punch List is generated. Corrective work and replacement materials shall be in accordance with the Drawings and Specifications. After corrective work is completed, the Contractor shall again request a Final Review for Final Completion as outlined above. The Contractor shall continue maintenance of landscaped areas until such time as corrective measures have been completed and accepted by the Landscape Architect.
- C. Condition for Acceptance at Completion of the Maintenance Period: Each plant shall be alive and thriving, showing signs of growth and no signs of stress, disease, or other weakness.

Replace plants not meeting these conditions and re-commence the Maintenance Period for such plants. After Final Completion the Owner will assume responsibility for Landscape Maintenance.

3.10 CLEAN-UP AND PROTECTION

- A. Keep all areas of work clean, neat and orderly at all times.
- B. Clean up and remove all deleterious materials and debris from the entire work area prior to Final Acceptance.

PART 4 – METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. The work associated with TREES, SHRUBS and PLUGS shall be paid per EACH price bid, and MULCH shall be paid per the SQUARE YARD. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the owner for approval.

PART 5 – BASIS OF PAYMENT

5.01 PAYMENT

- A. The work associated with TREES, SHRUBS and PLUGS shall be paid per EACH price bid, and MULCH shall be paid per the SQUARE YARD which includes materials, labor, equipment, transportation, and supervision necessary to complete the installation of items identified herein, and any incidentals necessary for completion of the specified herein as shown on the Contract drawings or as directed by the Engineer.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
329300.01	Tree, 3” Caliper	Each
329300.02	Tree, Ornamental	Each
329300.03	Shrubs	Each
329300.04	Perennial Plugs	Each
329300.05	Mulch	Square Yard

END OF SECTION

PLANTING OF TREES AND SHRUBS

SECTION 32 93 10

PART I - GENERAL

I.01 RELATED DOCUMENTS

- A. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section including, but not limited to, all Drawings, all Specifications, General Conditions, and General Requirements including submittals.
- B. Related Sections include the following:
 - 1. Section 02 31 00 "Soil Preparation & Fine Grading"
 - 2. Section 32 92 00 "Seed, Fertilizer and Mulch"

I.02 DESCRIPTION OF WORK

- A. The work of this Section consists of:
 - 1. Planting trees, shrubs, perennials; placement of planting, mulch, and warranty of plantings.
 - 2. Maintenance of the following: Trees, Shrubs & other Plant Materials, Lawn.

I.03 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum laced as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of exterior plant required.
- D. Clump: Where three or more young trees were planted in a group and have grown together as a single tree having three or more main stems or trunks.
- E. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. The container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of exterior plant required.
- F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted exterior plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of exterior plant.

- G. Finish Grade: Elevation of finished surface.
- H. Landscape Maintenance: All work and materials necessary to establish the landscape from the time of transplanting, planting, seeding and/or sodding. Maintenance shall include existing plants retained but not include any cleaning or rectification work necessary due to defects under this contract or damage by others due to inadequate protection required by this contract.
- I. Maintenance Period: Contract period starting at the time of planting and running until end of Warranty Period.
- J. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- K. Multi-Stem: Where three or more main stems arise from the ground from a single root crown or at a point right above the root crown.
- L. Planting Soil: Native or imported topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- M. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.
- N. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.
- O. Tip pruning: remove growing tips of plants at any time of year other than flowering period.
- P. Light pruning: remove growing tips and immature woody growth after flower and fruiting for evergreen plants or during dormant period for deciduous plants.
- Q. Hard pruning: remove growing tips, immature wood and mature wood late winter or early spring.
- R. Weed: Any plant or viable reproductive part of a plant that is not on the Plant Schedule.

I.04 QUALITY ASSURANCE

- A. Certificates:
 - 1. Submit certificates of inspection required by law for transportation of each shipment of plants along with invoice.
 - 2. File copies of certificates after acceptance of material. Inspection by Federal or State Governments at place of growth does not preclude rejection of plants at project site.
- B. Applicable Standards: Apply standards for plant materials as described in the following:
 - 1. "American Standard for Nursery Stock," Latest Edition, American Association of Nurserymen, Inc.
 - 2. Hortus III - 1976 Edition, Bailey Hortorium, Cornell University.

- C. Installer Qualifications: A qualified landscape installer whose work has resulted in the successful establishment of exterior plants.
- I. Contractor will submit the following qualifications in writing:
- At least five (5) years of continuous business experience installing high quality plantings.
- The ability to procure all of the plant materials specified for this project. All plants will be procured from nurseries located in USDA Zone 5 or colder areas and all plants will be of the species, size, and quality listed on the Plant List and specified herein.
- Ownership of equipment required to perform the services shown on the Drawings and specified herein.
- A qualified project foreman and landscape laborers that have performed similar services over a five (5) year period.
- Installer's Field Supervision: Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.
- D. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- E. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
- I. Report on the suitability of topsoil for plant growth. State-recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.
- F. Restoration of damaged areas: All products supplied shall comply with applicable state and local codes.
- I. Inspections and Approvals: During the restoration work, coordinate the following inspections and secure approvals prior to continuing on to the next work component, as applicable. For lawn area and/or shrub bed restoration, the Landscape Architect shall inspect and approve sub-grade preparation, soil placement and preparation, seeding/sodding and planting/mulching.
- G. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."
- H. Selection of exterior plants purchased under allowances will be made by Landscape Architect, who will tag plants at their place of growth before they are prepared for transplanting.
- I. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above the ground for trees up to 4-inch caliper size, and 12 inches above the ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.
- J. Observation: Landscape Architect may observe trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size,

and quality. Landscape Architect retains the right to observe trees and shrubs further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Landscape Architect of sources of planting materials 21 days in advance of delivery to site.
- K. Preinstallation Conference: Conduct conference at Project Site.
- L. Performance Requirement: Be responsible for all procedures necessary to maintain the plants in a state of continuing healthy growth and in optimum physical and aesthetic condition. Use preventative and corrective maintenance procedures to ensure that living landscape materials:
1. are strong, vigorous and stable.
 2. have foliage of normal size, shade, density and color.
 3. have deep symmetrical/radial, well-branched fibrous roots.
 4. are tolerant of irregular watering and water stress.
 5. have low susceptibility to pests and diseases.
 6. are resistant to weed invasion and establishment.
 7. are stable in strong winds.
 8. are without nutritional deficiencies and toxicity.
 9. reuse other landscape waste.

I.05 PROJECT CONDITIONS

- A. Protection of Existing Plants to Remain:
1. Operations: Do not store materials or equipment, permit burning, or operate or park equipment under the branches of all existing plants to remain.
 2. Barriers: Confirm that all tree protection fencing has been installed.
 3. Notification: Give written notification if other construction activities threaten to damage existing plants to remain.
- B. Replacement of Damaged Plants:
1. Replace existing plants to remain, which are damaged during construction with accepted plants of the same species and size as those damaged at no cost to Owner.
 2. Project Architect will determine the extent of damage and value of damaged plants.
- C. Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance until the date of Substantial Completion. Any replacement planting shall also occur within the following periods:

Herbaceous Plants:

Where Irrigated: April 15-October 15

Non-Irrigated April 15-June 15

September 15-October 15

Woody Plants:

Where irrigated: March 15-November 30

Non-Irrigated: March 15-June 30

October 1-November 30

- D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed according to manufacturer's written instructions and warranty requirements.
- E. Lawn / Planting Area Restoration: The Landscape Architect shall determine the level of restoration necessary depending on the amount of damage to the existing planting areas and soils. Areas that have been driven on extensively and are compacted or bare will require replacement, whereas areas where turf is thinned or dead but still present will require reseeding only.
- F. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns unless otherwise acceptable to Landscape Architect.
- I. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

I. 06 WORK SCHEDULE

- A. Proceed with the work as rapidly as the site becomes available, consistent with normal seasonal limitations for planting work.

I.07 SELECTION, TAGGING AND ORDERING OF PLANT MATERIAL

- A. General: All plant materials shall be selected and tagged by the Landscape Architect at the nursery, prior to delivery on site. The Contractor shall notify the Landscape Architect when all (or most) of the plant materials are available for inspection. Trees delivered to the site without the Landscape Architect's tags and/or trees damaged in shipment may be rejected upon delivery.
- B. Documentation: Submit documentation within 10 days after award of Contract that all plant materials have been ordered. Arrange procedure for review of plant materials at time of submission.
- C. Transportation: Contractor shall accompany Landscape Architect to all review(s) of plant materials at the nursery. The Landscape Architect will review and tag plants at place of growth and upon delivery for conformity to specifications.

- D. Distant Material: Submit photographs with a person and a measurement stick with clearly marked lengths, adjacent to plants for preliminary review. Such reviews shall not supersede the right of rejection at the project site.
- E. Unavailable Material: If written proof is submitted that any plant specified is not available, the Contractor may submit a proposal to use the nearest equivalent size or variety with corresponding adjustment of Contract price. Substitutions will only be considered after Contractor has exhausted all procurement options, including local and distant nurseries and plant brokers. Substitutions require the approval of the Landscape Architect.
- F. Special Conditions. The above provisions shall not relieve the Contractor of the responsibility of obtaining specified materials in advance if special growing conditions or other arrangements must be made to supply specified materials.

I.08 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Labeling: Furnish standard plants bearing original labels legibly genus/species and name of grower.
- B. Storage: Store plant materials in fully equipped nursery yards. Ball and burlap rootballs will be placed in wood mulch and completely covered. Container plants will be protected from sunscald. All plants will be watered daily by means of an automatic irrigation system. Trees and shrubs will be arranged so as not to crowd the branches, allowing for the natural growth of the plant.
- C. Deliver exterior plants freshly dug.
 - I. Immediately after digging up bare-root stock, pack the root system in wet straw, hay, or other suitable material to keep root system moist until planting.
- D. Handling: Do not lift or handle container plants by the tops, stems or trunks at any time. Do not bind or handle plants with wire or rope at any time. Handle B&B plant stock by root ball only.
- E. Anti-Desiccant: At Contractor's option, spray all evergreen or deciduous plant material in full leaf immediately before transporting with anti-desiccant. Apply an adequate film over trunks, branches, twigs and foliage.
- F. Digging: Dig ball and burlap plants with firm, natural balls of earth of diameter not less than that recommended by USDA Standard for Nursery Stock, and of sufficient depth to include the fibrous and feeding roots.
- G. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery and handling.
- H. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants and trees in shade, protect from weather and mechanical damage, and keep roots moist.

- I. Heel-in bare-root stock. Soak roots that are in dry condition in water for two hours. Reject dried-out plants.
- J. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
- K. Do not remove container-grown stock from containers before the time of planting.
- L. Water root systems of exterior plants stored on-site with fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

I.09 MAINTENANCE PERIOD AND FINAL ACCEPTANCE:

- A. Maintain installed trees, shrubs, perennials and vines for a period of two (2) years following Substantial Completion per the requirements of this section.

I.10 WARRANTY PERIOD

- A. Warranty Period: All plants will be warranted for two (2) years following the date of Substantial Completion. At the Landscape Architect's discretion, portions of the work will be accepted prior to completion of the entire project.
- B. Warranties:
 - 1. Correct Species: Warrant that all plant materials are true to species and variety. Substitutions will only be accepted in writing prior to delivery to site. Plants on site that do not meet the requirements of Drawings and specifications as determined by the Landscape Architect will be removed and replaced at no cost to the Owner.
 - 2. Vigor: Warrant that all trees, shrubs planted under this Contract will be healthy and in flourishing condition at the completion of Warranty Period.
- C. Delays: All delays that extend the planting into more than one planting season shall extend the Warranty Period correspondingly.
- D. Condition of Plants: Plants shall be free of dead or dying branches and branch tips, with all foliage of normal density, size and color.
- E. Replacements: As soon as weather conditions permit, and only during approved planting seasons, replace, without cost to Owner, all dead plants and all plants not in a vigorous, thriving condition, as determined by Landscape Architect during and at the end of Warranty Period.
- F. Exclusions. The Contractor shall not be held responsible for failures due to vandalism during Warranty Period. Report such conditions to The Landscape Architect.

I.11 REPLACEMENTS

- A. Warranty: For the period between the time of Substantial Completion of planting and the end of the warranty, the Contractor is responsible for up to (2) replacements per plant. Plants that require replacement will be any new or transplanted

plant material that is dead, or that is, in the opinion of the Landscape Architect, in unhealthy or unsightly condition. Including plants that have lost their natural shape, or that have been damaged beyond repair due, in the judgment of the Landscape Architect, to inadequate maintenance and/or protection from animal damage or the natural elements.

B. Failed Materials:

1. Plant materials exhibiting conditions, which are determined as being unacceptable due to workmanship by the Contractor, shall be repaired and/or replaced at no additional cost to the Owner as determined by the Landscape Architect.
2. Closely match replacements to adjacent specimens of the same species.

C. Incorrect Materials:

1. During Warranty Period, replace at no cost to Owner all plants revealed as being untrue to name.
2. Provide replacements of size and quality to match the planted materials at the time the mistake is discovered.

I.12 SUBMITTALS

A. Submit the following to Landscape Architect for approval prior to delivery to site. Attach product name, address of manufacturer and/or supplier to each sample.

1. Tree and Shrub Time-Release Fertilizer Tablet or Packet: one sample, manufacturer's description and testing results.
2. Stakes, Anchors, Brace Strap, Clamps, Turnbuckles and Guy Wires for Trees: one sample of each.
3. Mulch: one quart sample with product name, product analysis, manufacturer, and manufacturer's address.
4. Humus Mulch: One-quart sample and manufacturer's analysis.
5. Anti-desiccant: manufacturer's product literature.
6. Tree ordering and Substitution: submit full plant substitution list indicating scientific name of specified tree, scientific name of substitution tree, and substitution nursery name, address, and contact person for approval prior to ordering plants. The substitutions will be carefully reviewed by Landscape Architect. The Contractor will be required to present documentation of researching all reasonable sources for supplying the specified plants prior to the acceptance of substitutions.
7. Qualification Data: For qualified landscape Installer.
8. Material Test Reports: For existing surface soil and imported topsoil.
9. Planting Schedule: Indicating anticipated planting dates for exterior plants.
10. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of exterior plants during a calendar year. Submit before expiration of required maintenance periods.
11. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 - a. Manufacturer's certified analysis for standard products.
 - b. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
12. Backfill Mix: 1 quart sample

PART 2 - PRODUCTS

2.01 PLANT MATERIALS

- A. General: Verify that all container stock has been grown in the containers in which delivered for at least 2 months, but not over 2 years for shrubs or 2 years for perennials and groundcovers. Do not install container plants that have cracked or broken balls of earth when taken from container.
1. Growing Conditions: Plants shall be nursery-grown in accordance with good horticultural practices under climatic conditions similar to those of the project for at least two years unless otherwise specifically authorized.
 2. Appearance: Superior in form for their species, with regard to number of branches, compactness and symmetry.
 3. Vigor: Plants shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs, or larvae. They shall have healthy, well-developed root systems. Plants shall be free from physical damage or adverse conditions which would prevent thriving growth.
- B. Condition of Root System: Samples must prove to be completely free of circling, kinked or girdling trunk surface and center roots and show no evidence of a root-bound condition.
- C. Measurements:
1. General: Measure plants when branches are in their normal upright position. Height and spread dimensions specified refer to main body of plant and not branch tip to tip. Take caliper measurement at a point on the trunk 6 in. above the natural ground line for trees up to 4 in. in caliper and at a point 12 in. above the natural ground line for trees over 4 in. in caliper.
 2. Size Range: If a range of size is given, do not use plant materials less than the minimum size. The measurements specified are the minimum size acceptable and are the measurements after pruning, where pruning is required. Plants that meet the measurements specified, but do not possess a normal balance between height and spread shall be rejected.
 3. Substitutions: Substituted plants shall be true to species and variety and shall conform to measurements specified except that plants larger than specified may be used if accepted. Use of such plants shall not increase Contract price. If larger plants are accepted, increase the rootball size in proportion to the size of the plant.
- D. Pruning: Do not prune plants before delivery.
- E. Condition: Trees, which have damaged or crooked leaders, will be rejected. Trees having a main leader shall not have been headed back. Trees with abrasions of the bark, sunscalds, disfiguring knots, or fresh cuts of limbs over 3/4 in. which have not completely callused, will be rejected.

2.02 PLANTING BACKFILL MIX FOR PLANT PITS AND PLANT BEDS:

- A. Backfill Mix: Backfill mix shall consist of one-part sterilized cow manure, one part pulverized peat moss, and four parts of specified topsoil. Thoroughly mix all ingredients prior to installation in planting pits and vaults.

2.03 COMMERCIAL FERTILIZERS

- A. Tree and Shrub Fertilizer Tablets: Complete fertilizer, 50 percent of the nitrogen to be derived from natural organic sources or urea-form. Available phosphoric acid shall be from superphosphate, bone or tankage. Potash shall be derived from muriate of potash containing 60 percent potash:

20% Nitrogen
10% Phosphoric Acid
5% Potash

2.04 STAKING MATERIALS

- A. Tree Stakes: Stakes shall be sound wood of uniform size, reasonably free of knots and capable of performing their function for at least two (2) years. Tree support stakes shall be 3-inch diameter debarked cedar or 2-inch x 2-inch hardwood posts 9 feet long.
- B. Tree straps shall be 12" x 1 1/2" nylon weave with a 3/4" grommet at each end. Submit sample for approval.
- C. Guy wire: 2-strand pliable zinc-coated, 12-gauge steel wire minimum.

2.05 GUYING MATERIALS

- A. Hardware
 - 1. Tree straps shall be 12" x 1 1/2" nylon weave with a 3/4" grommet at each end. Submit sample for approval.
 - 2. Guy wire: 2-strand pliable zinc-coated, 12-gauge steel wire minimum.
 - 3. Turnbuckles: Galvanized or zinc plated and weldless.
 - 4. Cable Clamps: Galvanized size as required.
 - 5. Protection Collars: 3/8 in. diameter x 30" long white PVC. Provide all guyed installations as directed by Landscape Architect.
 - 6. Visible flagging connected to guy wires: orange plastic tape tied to guy wires for duration of guying period.

2.06 WATER

- A. Clean, fresh and potable, furnished and paid for by Contractor.

2.07 PLANTING MULCH

- A. Tree and Shrub Mulch shall be processed shredded cedar only, not to exceed 2" in size, as approved by the Landscape Architect. Mulch shall be placed to the depth shown and as directed and approved. Sample of mulch shall be submitted to the Landscape Architect, before starting work. Bark mulch shall be composted for a minimum of one year to lessen the buildup of heat. Contractor to furnish and install mulch for all plantings completed under this contract.
 - 1. Mulch for trees and shrub plantings will be a 3" coverage of Premium Cedar

Double Shredded Bark Mulch by Autumn Ridge Stone & Landscape Supply or approved equal local to South Haven.

Autumn Ridge Stone & Landscape Supply
5960 136th Ave, Holland, MI, 49424
P. 616.786.2800 F. 616.786.0120

- B. Perennials and vines will be mulched with a 2" thickness of pine bark and compost, individual pieces not to exceed 1" in size, as approved by the Landscape Architect. Mulch shall be placed to the depth shown and as directed and approved. Sample of mulch shall be submitted to the Landscape Architect, before starting work. Bark mulch shall be composted for a minimum of one year to lessen the buildup of heat. Contractor to furnish and install mulch for all plantings completed under this contract.
- I. Perennials will be mulched with pine bark and compost such as "One Step Mulch and Soil Conditioner" or approved equal.

2.08 ANTI-DESICCANT

- A. Type: Anti-desiccants for retarding excessive loss of plant moisture and inhibiting wilt shall be sprayable, water insoluble beta-pinene polymer which will produce a moisture retarding barrier not removable by rain or snow.

2.09 TREE WRAP: First quality 4 inch wide, bituminous impregnated, corrugated, with a minimum 25% stretch factor. Duct tape of any type is prohibited.

PART 3 - EXECUTION

3.01 PRE-PLANTING REVIEW

- A. General: Do not commence planting work without written acceptance by Landscape Architect of Soil Preparation and Fine Grading, Section 02 31 00.
- B. Finish Grades shall have been established in accordance with the Fine Grading Section. Verify that all grades are within 1 in. plus or minus of required finish grade and that all soil amendments and topsoil have been installed. Fine rake planting beds prior to planting shrubs. The Landscape Architect will inspect the site prior to planting and direct grading and soil preparation adjustments as necessary prior to planting.
- C. Notification: Submit written notification of all conditions inconsistent with specifications for soil preparation and mixing.
- D. Surface Drainage: Maintain 2% minimum slope for drainage in planted areas as shown on grading plans except for wetlands planting area.
- E. Discrepancies: Submit in writing, all discrepancies in the Drawings or Specifications, obstructions on the site, or prior work done by others, which the Contractor feels precludes maintaining proper drainage; include description of all work required for correction or relief of said discrepancies.
- F. Detrimental Drainage, Soils and Obstructions:

1. Notification: Supply written notification of all conditions detrimental to growth of plant material. State condition and submit proposal and cost estimate for correcting condition.
2. Testing: Where heavy clay is present, test drainage of plant beds and pits by filling with water twice in succession. Give written notification of conditions permitting the retention of water in planting beds for more than twenty-four (24) hours.
3. Correction: Submit for acceptance a written proposal and cost estimate for the correction of poor drainage conditions before proceeding with work.
4. Obstructions: If rock, underground construction work, tree roots or other obstructions are encountered in the excavation of plant pits, alternate locations may be used as directed by Landscape Architect. Where locations cannot be changed, submit the cost required to remove the obstructions to a depth of not less than 6 in. below the required pit depth. Proceed with work after acceptance.

3.02 LAYOUT AND EXCAVATION OF PLANTING AREAS

- A. Layout and Staking: At least 7 days prior to proposed planting, contractor will stake the location of proposed trees and the edges of proposed shrub masses for approval by the Landscape Architect. Mark tree locations with wood stakes that are labeled with each tree species abbreviation, per the Planting Plan.
- B. Review: Landscape Architect will review layout, direct adjustments, and approve all tree and shrub locations before planting begins.
- C. Equipment for Digging Plant Pits: Use of a vernier spade to dig plant pits is prohibited. Auger is acceptable with scarification of the pits during augering. Backhoe is acceptable, with scarification of the tree pit during excavation.

3.03 PLANTING OPERATIONS

- A. General:
 1. Store delivered plants on site only in locations approved by the Landscape Architect. Stored plants will be mulched in and watered every day. No plants will be stored, on or off site, between November 30th and March 1st.
 2. Protect plants at all times from sun or drying winds.
 3. Stand all stored trees upright and support in place.
 4. Keep plants that cannot be planted immediately upon delivery in the shade, well-protected, and well-watered.
 5. Heel in and protect with burlap all B&B plant materials, which cannot be planted upon delivery.
- B. Handling and De-potting of Plant Materials:
 1. Avoid all damage to containers and rootballs. If rootball is cracked or broken during handling, plant will be rejected.
 2. Container Grown Plant Material: remove plant from container tease tangled or circling roots out from rootball prior to placement in planting pit.
 3. Balled and Burlap Plants: Lift and carry by bottom of ball only. Do not remove wrapping until plant is set in plant pit. Cut and completely remove metal basket and tie wire. Remove twine and burlap from upper 1/2 of rootball prior

to backfilling.

- C. Installation:
1. Scarification:
Plant Pit: Excavate deep enough to accommodate the ball and bed of prepared back fill mix. Compact before setting of plants. Scarify sides of plant pit, thoroughly breaking up all surfaces and eliminating all "glazed" areas.
 2. Positioning: Backfill plant pit as required to allow setting crown of trees 4 inches above surrounding finish grade. Thoroughly foot-tamp all backfill placed under the rootball. Position plant in planting pit while maintaining plumb condition.
 3. Backfilling:
 - a. Use backfill mix as specified herein. Brace each plant plumb and rigidly in position until planting soil has been tamped solidly around the ball and roots.
 - b. When plant pits have been backfilled approximately 2/3 full, water thoroughly and saturate rootball, before installing remainder of the backfill mix to top of pit, eliminating all air pockets.
 4. Fertilizer Tablets: Place evenly distributed in plant pits when backfilled 2/3 according to the following schedule:
 - a. Container stock:
 - 1 gallon can - 2 tablets
 - 5 gallon can - 4 tablets
 - 15 gallon can - 6 tablets
 - b. B & B stock:
 - 1 tablet per in. caliper or 1 ft. of height, whichever is less
- D. Adjustment: Adjust trees and shrubs so that after full settlement has occurred, the grade at the base of the trees is 4 in. above the adjacent planting finish grade and the grade at the base of the shrubs is 1 in. above the adjacent planting finish grade.
- E. Irrigation: Install as many of the irrigation components as possible prior to tree and shrub irrigation per Section 32 84 00 'Irrigation System'. After planting is complete in each irrigation zone, install nozzles, tree rings and the like. Hand water trees and shrubs daily until irrigation is fully operational.
- F. Watering Basin: Form saucer with 3 in. high, 3' diameter berm centered around tree pits at least.
- G. Watering: Thoroughly water all plants immediately after completion of planting operations to ensure good soil to root contact and minimize air pockets.
- H. Labels: Remove all nursery-type plant labels from plants.
- I. Pruning
1. All pruning is to be performed by Certified Arborists only.
 2. Required height and spread sizes must be met after pruning is performed.
 3. Trees and shrubs are to be pruned as necessary to remove dead and/or injured twigs, branches and limbs. Pruning shall be done in such a manner as not to change the natural shape or habit of the plants.

4. Pruning shall be done with clean, sharp hand pruners or pruning saws. The use of hatchets, axes, shovels or other implements not specifically designed for pruning is prohibited.
5. All cuts shall be made so as to produce a small collar, but leave no stubs. Cuts shall be made in such a manner as to preclude the tearing, stripping or other damage to adjacent bark, limbs or branches.

3.04 STAKING AND GUYING

- A. General:
 1. Staking of deciduous trees and Guying of evergreen trees is required under all conditions unless otherwise approved by Landscape Architect.
- B. Staking:
 1. Trees that require staking will be staked as follows.
 - a. Locate stakes in line with the trunk of tree, due west and east of the trunk and between 2 and 6 inches of the outside of the rootball. Drive stakes at least 30 in. into firm ground.
 - b. Bracing straps shall be placed around the trunk in a single loop. Run cable through grommets on support clamp, fasten turnbuckle, clamp, fasten cable to strap and around stake, fasten with clamp and tighten turnbuckles.
- C. Guying above grade:
 1. Guy trees at points of branching, with guys spaced equally around and outside perimeter of ball.
 2. Guys: Provide one turnbuckle for each guy. Use 2 cable clamps at each cable connection. Place white PVC pipe as guy covers on all guys.
 3. Attach flags to each guy wire, 30 inches above finish grade.
- D. Tree Wrap: Apply tree wrap in the fall season after being planted and remove wrap in the spring as noted in Section 02970.

3.05 MULCHING

- A. Install a 3-inch-deep layer (as measured after settlement) of specified mulch over all tree pits (including tree watering basins) and over shrub rootballs.
- B. Install a 2-inch-deep layer of specified mulch in perennial and vine beds only.

3.06 WOODY PLANT MATERIAL

- A. Place mulch around each planted shrub or tree to protect them from competition and to moderate soil temperatures.
- B. For optimal survival, transplant trees in early spring while they are dormant. Avoid transplanting trees in summer.
- C. If predation from beavers or deer is a concern, place each tree or shrub in a protective cage.

3.7 MAINTENANCE AND MONITORING

- A. All plants installed under this contract will be maintained until the end of the Warranty Period. Payment for the maintenance will not be made separately. Maintenance includes but is not limited to watering, weeding, pruning, removal and replacement, and the application of herbicides and insecticides. Only qualified, trained personnel possessing a valid Applicators License will be allowed to apply herbicides and pesticides
- B. Weed Control is critical for the success of shrubs and trees in seeded areas. Efforts should be focused on noxious weeds listed in the Michigan Noxious Weed Law (Michigan Administrative Code 2002) as these species are the most difficult to control. The sooner control methods are started, the easier to control or eliminate a species; otherwise the infestation may be impossible to control. If noxious weeds are found at a site before grading, pre-treat the site with an approved herbicide until the weeds have been eliminated. After planting, carefully monitor the site and if noxious weeds occur, control the weeds using an Integrated Weed Management Plan targeted for the specific species. An Integrated Weed Management Plan combines several methods (mechanical, biological, and herbicides) in the most effective and least environmentally damaging way to control a species.
- C. Continually check for erosion and repair the eroded area as soon as possible to prevent greater damage.
- D. Tree and Shrub Maintenance: Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, adjusting and repairing stakes and guy supports and root-ball stabilization, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings.
- E. Ground Cover and Plant Maintenance: Maintain and establish plantings by watering, weeding, fertilizing, mulching, and other operations as required to establish healthy, viable plantings.
- F. Staking and guying removal: Remove above grade tree staking and guying at end of warranty period.

3.08 OTHER SITE FEATURES

- A. All other site features either damaged or destroyed during the execution of this contract shall be repaired to the satisfaction of the Engineer or to the installation specifications of the manufacturer of the approved replacement item. These include but are not limited to walls, sidewalks, curbs, stairways, wood decking, driveways, etc.

3.09 FINAL COMPLETION

- A. Acceptance: Work shall be accepted by the Landscape Architect upon substantial completion of the Work, including Maintenance Period, but exclusive of replacement of materials under the Warranty Period. Submit a written request to the Landscape Architect for review for Final Completion at least 21 working days prior to anticipated Final Review date, which is after the end of the Maintenance Period.
- B. Corrective Work: Work requiring corrective action or replacement in the judgement of the Landscape Architect shall be performed within ten calendar days after the Final Review and the Punch List is generated. Corrective work and replacement materials shall be in accordance with the Drawings and Specifications. After corrective work is completed, the Contractor shall again request a Final Review for Final Completion as outlined above. The

Contractor shall continue maintenance of landscaped areas until such time as corrective measures have been completed and accepted by the Landscape Architect.

- C. Condition for Acceptance at Completion of the Maintenance Period: Each plant shall be alive and thriving, showing signs of growth and no signs of stress, disease, or other weakness. Replace plants not meeting these conditions and re-commence the Maintenance Period for such plants. After Final Completion the Owner will assume responsibility for Landscape Maintenance.

3.10 CLEAN-UP AND PROTECTION

- A. Keep all areas of work clean, neat and orderly at all times.
- B. Clean up and remove all deleterious materials and debris from the entire work area prior to Final Acceptance.

END OF SECTION

PART I - GENERAL**1.01 SUMMARY OF WORK**

A bio-retention area or rain garden is a Best Management Practice which is designated to enhance infiltration of storm water runoff. The plantings within the rain garden area will aid in evapotranspiration and infiltration and infiltration as well as the transformation and retention of pollutants found in storm water runoff. Work shall include but not limited to:

- A. Subgrade preparation and removal of excavated soils from site.
- B. Provision, installation and connection of gravel filters and underdrain structures to existing stormwater systems.
- C. Provision and installation of amended soil.
- D. Provision, installation and establishment of mulch, seed, and native plant plugs.
- E. Provision, installation of landscape stone at edge of rain gardens for erosion protection from upstream runoff.
- F. Maintenance and guarantee of the rain gardens for a period of 1 year.

PART 2 – PRODUCTS**2.01 AMENDED SOILS**

- A. Amended soils shall consist of a homogeneous mixture of 50% construction sand and 50% aged leaf compost. The amended soil shall be free of any other material, including stumps, roots, other plant material or any other deleterious material.
- B. Sand shall be clean construction sand, free of deleterious materials. It shall conform to AASHTO M-6 or ASTM C-33 with a grain size of 0.02 inches to 0.04 inches. MDOT Class I Sand is acceptable. A sample of the sand shall be made available to the Designer or Owner's Agent prior to mixing the amended soils.
- C. Compost shall be aged yard-leaf compost. The pH shall be between 5.5 and 8.5. Particles shall be able to pass thru a 1-inch screen or smaller. Compost that smells putrid, has an ammonia odor, or shows visible signs of mold is unacceptable. A sample of the compost shall be made available to the Designer or Owner's Agent prior to mixing the amended soils.
- D. Amended soil shall be thoroughly mixed (preferably off-site) prior to placement in the rain garden areas. A sample of the amended soils shall be provided to the Designer or Owner's Agent several weeks prior to installation of the rain gardens.
- E. When backfilling the amended soils, place the first 3 to 4 inches of soil equally across the basin then till into the existing soils to create a gradation zone. Backfill the remainder of the amended soils in lifts of 12 inches, taking care not to compact the installed soils.
- F. Grade amended soils with light equipment such as a compact loader or dozer loader with marsh tracks. Compaction can be accomplished by tamping with a bucket from a dozer or backhoe.

Heavy construction equipment shall not drive on rain garden areas after the amended soils have been placed in the basins.

2.02 PLANTS AND PLANTING

A. Native plant plugs should be true to species. The following is a suggested plant list:

Scientific Name	Common Name	QTY
<i>Asclepias incarnata</i>	Swamp milkweed	38
<i>Coreopsis lanceolata</i>	Sand coreopsis	76
<i>Echinacea purpurea</i>	Purple coneflower	38
<i>Liatris aspera</i>	Rough blazing star	38
<i>Monarda fistulosa</i>	Wild bergamot	76
<i>Symphyotrichum novae-angliae</i>	New England aster	76
<i>Tradescantia ohioensis</i>	Common spiderwort	38
Total Plugs		380

- B. Native plant material shall be of genotypes from the north central states only (IL, IN, IA, MI, OH), and from a recognized nursery of this region.
- C. Approved native plant suppliers include:
 - a. JFNew 574-586-3400
 - b. WildType Native Plant Nursery 517-244-1140
 - c. The Native Plant Nursery 734-677-3260
 - d. Wetlands Nursery 989-752-3492
 - e. Or an approved equal
- D. Any substitutions must be approved by the Designer or Owner’s Agent at least 14 days before planting is scheduled.
- E. Plugs shall be installed from April 1 thru June 15. Irrigation is preferred but not mandatory. Plant plugs may be installed from June 16 through August 31 only if irrigation can be provided to deliver a total of 1 inch of water per week including natural precipitation. Any exceptions must be approved by the Designer or Owner’s Agent.
- F. The rain garden basin planting will be accomplished according to the planting plan sheet shown at the end of this specification.
- G. Contractor shall use qualified workmen who are experienced with commercial landscaping with native species and have previously planted constructed wetlands or rain garden systems.
- H. Stakes shall be set to mark the planting zones and the locations reviewed the Designer or Owner’s Agent/ Plants will be planted on 12-18 inch centers as shown on the plans.
- I. Remove all containers and packaging materials before planting and remove from site.
- J. The method for planting plugs into the ground will consist of inserting and rotating a trowel or dibble through the mulch layer into the soil inserting the plant root plug into the hole created so that they are completely buried to the root collar in the soil. Take care to avoid damage to the root structure/ Plant plugs shall be buried so that the top of the root plug or root collar is even

with the top of the amended soil but shall not be buried so that the plant stems or leaves are below the amended soil surface.

- K. Thoroughly soak the root matter of the plugs with water after planting. Plant plugs should receive a minimum of an inch of water per week, including rainfall.
- L. The planting zone stakes shall be removed following completion of planting as directed by the Owner's Agent.
- M. All disturbed soils of native planting areas shall be seeded with fescue grass seed (*Festuca* sp.) or other turf grass mix approved by the Designer in a manner that a ¼-inch layer of soil covers the seed. After seeding, all disturbed areas shall be covered with a temporary straw blanket or erosion control blanket approved by the Designer or Owner's Agent.
- N. Lawn Seeding shall be done between May 1 and June 15 or between August 15 and September 15 or as otherwise approved by the Designer or Owner's Agent.
- O. Shredded hardwood mulch shall be applied no less than 2 inches and no more than 3 inches thick on areas of plug plantings, but not over seeded areas. Mulch shall be mounded around the base of plants or trees and shall not be packed tightly around the plant plug stem or leaves. Mulch shall be shredded hardwood mulch, well-aged (stockpiled or stored for at least 12 months). Uniform in color, and free of foreign material, including plant materials. Mulch that smells putrid, has an ammonia odor, or shows visible signs of mold is unacceptable.

2.03 LANDSCAPE STONE

- A. Native stone to be used as noted on the drawings at perimeter of rain gardens to dissipate energy from storm water runoff from up gradient surfaces.
- B. The stone should range in size between 3 to 4 inches in dia.

PART 3 - EXECUTION

3.01 PRECONSTRUCTION

- A. Under this section, the Contractor shall furnish all labor, materials and equipment necessary to construct the rain garden system.
- B. The Contractor shall submit to the Designer sources for seed and plugs 21 days after the contract award.
- C. The Contractor shall submit to the Designer a plan and schedule for planting at least 14 days prior to the scheduled commencement of work.
- D. The Contractor shall submit to the Designer sources for the aggregate, mulch, compost, and sand. The Contractor shall contact the Designer or Owner a minimum of 48 hours before creating the sand and composted amended soil mixture.
- E. The Contractor shall submit to the Designer material cut sheets for geotextile fabric, erosion control fabric, drain basins, grates and pipe.
- F. The Contractor shall submit to the Designer or Owner's Agent a plan and schedule for construction and planting at least 21 days prior to the scheduled commencement of work.

3.02 CONSTRUCTION OBSERVATION

- I. The Contractor must notify the designer or Owner's Agent in advance when specific items are ready for observation. The Construction shall not proceed without the Owner's Agent on the site at the specific points indicated below, unless the express consent of the Designer or Owner's Agent is given to proceed. The Designer or Owner's Agent may stop construction and/or have materials removed at the Contractor's expense if no notification or approval to proceed is given.
 1. Start of Construction – locations of utilities and location/layout of rain gardens, location and installation of appropriate temporary erosion control measures.
 2. Completion of Excavation – review of bottom contours, slopes, elevations, and compaction/porosity/infiltration rates of underlying native soils.
 3. Placement of Underdrain Structures and Gravel Blankets – materials prior to installation, internal connections, connections to stormwater structures, appropriate drainage, as well as slopes and invert elevations.
 4. Placement of Amended Soils – material approval prior to placement, tilling of underlying native soils, depth of amended soils, final grade of amended soils.
 5. Planting – mulch and plant materials prior to installation, layout and spacing of plant plugs, depth of mulch, seed materials prior to installation.
 6. Completion of Construction – seeding and installation of permanent erosion control measures, removal of excess or excavated materials, general cleanliness and completion of work areas.

3.03 EXCAVATION AND GRADING

- A. The Contractor shall be responsible for contacting Miss Dig (811), underground utility marking prior to any excavation activities. The location of any private utilities will be the responsibility of the Contractor.
- B. An approved Sediment and Erosion Control Plan must be implemented prior to initiation of clearing and Owner.
- C. The excavation and grading of the rain garden will be accomplished according to the details shown on the plans.
- D. Heavy equipment and traffic shall be restricted from traveling over the rain garden basins to minimize compaction of the soils. When possible, excavation to remove original soils will be performed without entering the basins.
- E. The long axis of the basin bottoms shall be sloped 0.5% from outside edge to the drain basin structures or connections to the storm sewer.
- F. The side walls of the basin shall be roughened or loosened where sheared or compacted by heavy equipment.
- G. Surface objects, trees, stumps, roots, rocks and other protruding objects not designated to remain shall be cleared and grubbed. Undisturbed sound stumps, and non-perishable solid objects may be left, provided that they are a minimum of three feet below the sub-grade or final grade on slopes and embankments.
- H. The Contractor shall not be permitted to bury cleared materials or construction debris on the project site or in the rain garden basins.

- I. The rain garden basins may not receive run-off until basins are planted and the entire contributing drainage area to the basins has received final stabilization.

3.04 ESTABLISHMENT AND ACCEPTANCE OF RAIN GARDENS

- A. By the end of the first year following planting, the rain garden and surrounding disturbed area shall show a uniform density of healthy specimens of the plants indicated on the planting plan. The rain gardens will also be free of weeds and trash, and covered in a uniform layer of mulch, as determined by the Designer or Owner’s Agent.
- B. Establishment of a dense stand of native flowering species in the rain gardens and uniform lawn in the disturbed areas around the rain gardens within the first year following planting is the responsibility of the Contractor.
 - 1. Uniform density is defined as 85% coverage of all garden areas, with no bare patches greater than 4 square feet within the rain gardens, or bare patches greater than 1 square foot within the areas of turf grass.
 - 2. Any area in the rain gardens that fails to show a uniform density of plants shall be replanted with appropriate plugs. Any bare patches around the borders will be reseeded with fescue until a uniform density of turf grass is established.
- C. Watering shall be the responsibility of the Contractor. Plugs and seed shall be kept moist for optimum plant growth (1 inch of water each week, including rainfall) for the first growing season. Any erosion resulting from watering shall be repaired by the Contractor.
- D. Weeding will be the responsibility of the Contractor. The rain gardens will be kept free of species other than those specified in the planting plan.
- E. Trash removal and maintenance of the drainage structures will be the responsibility of the Contractor. The drainage structures and inlets will be kept free of debris that may block storm flows and cause an overflow of the rain gardens.
- F. Protection from foot traffic, mowing, or herbicide application is the responsibility of the Contractor. Appropriate signage and/or fencing may be used following approval by the Designer or Owner’s Agent to protect the plantings until they are fully established.
- G. The Contractor shall replace, at no extra cost to the Owner all dead vegetation during the first year and will maintain the rain garden to ensure uniform healthy plant growth, in order for the site to be released by the Designer or Owner’s Agent so that the Contractor may be paid the final retainage.

PART 4 - MEASUREMENT AND PAYMENT

The Contractor shall be paid his unit price per Square Foot RAIN GARDEN and per Foot per BIO-SWALE installed which price will be payment in full for all work, equipment and materials, for a complete and functioning installation per the above noted specifications as well as detailed on the plans.

ITEM NO.	DESCRIPTION	Pay Item
329312.01	RAIN GARDEN	Square Foot
329312..02	BIOSWALE	Foot

UPLAND UTILITIESSECTION 33 00 00**PART I - DESCRIPTION****I.01 GENERAL**

For protection of underground utilities and in conformance with Public Act 53, the CONTRACTOR shall dial 1-800-482-7171 a minimum of three full working days, excluding Saturday, Sundays and Holidays, prior to beginning each excavation in areas where public utilities have not been previously located. Members will thus be routinely notified. This does not relieve the CONTRACTOR of the responsibility of notifying utility owners who may not be a part of the "Miss Dig" alert system.

The contractor will have to coordinate his work with the contractor installing the public utilities. The locations of these facilities are shown on the plans and are available for public viewing at the respective offices.

Additional compensation will be negotiated with the CONTRACTOR for delays due to material shortages or other reasons beyond the control of the OWNER, or for delays on construction due to the encountering of existing utilities that are, or are not, shown on the plans.

Work stoppages by employees of utility companies which results in a delay of utility revisions on any portion of this project may be considered the basis for a claim for an extension of time for completion but will not be considered the basis for a claim for extra compensation or an adjustment in contract unit prices.

END OF SECTION

UTILITY CONDUIT, 4"SECTION 33 00 10**PART I - GENERAL****I.01 RELATED DOCUMENTS**

- A. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section including, but not limited to, all Drawings, all Specifications, General Conditions, and General Requirements including submittals.

I.02 DESCRIPTION OF WORK

- A. This work shall be performed in accordance with the 2020 MDOT Standard Specifications for Construction and shall consist of all labor, equipment and materials required to install the Utility Conduit at the locations shown on the plans. The utility conduit will be used by either Consumers Power, Communication Company or for future irrigation installation.

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. Material shall comply with Section 706 of MDOT's Standard Specifications. The conduit will be furnished and installed by the Contractor.

PART 3 - EXECUTION**3.01 CONSTRUCTION METHODS**

- A. The item Utility Conduit, 4" shall be buried at a minimum depth of 30 inches, installed before the roadway cross section is installed and done in accordance with MDOT's specifications for conduit installation and at the locations shown on the plans. The ends of the conduit shall be capped to prevent the entry of soil.

PART 4 – METHOD OF MEASUREMENT**4.01 MEASUREMENT**

- A. The work associated with UTILITY CONDUIT will be measured for payment by LUMP SUM. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the owner for approval.

PART 5 – BASIS OF PAYMENT

5.01 PAYMENT

The work associated with UTILITY CONDUIT shall be paid per LUMP SUM price bid which includes materials, labor, equipment, transportation, and supervision necessary to complete the installation of items identified herein, and any incidentals necessary for completion of the specified herein as shown on the Contract drawings or as directed by the Engineer

ITEM NO.	ITEM	PAY UNIT
330010.01	Utility Conduit, 4"	Lump Sum

END OF SECTION

LIGHT FOUNDATION

SECTION 33 00 40

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section including, but not limited to, all Drawings, all Specifications, General Conditions, and General Requirements including submittals.

1.02 DESCRIPTION OF WORK

- A. The work of this Section consists of:
 - I. This item shall consist of furnishing all labor, equipment and materials necessary to install the complete light foundations as shown on the plans and as specified herein. Foundations shall include concrete, furnishing and setting of anchor bolts, coordination of obtaining and utilizing the bolt circle templates for street light fixtures, conduits, nuts, ground rods, grounding conductor and all miscellaneous hardware required to complete the foundation.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Concrete, anchor bolts, templates, conduits, nuts, washers, ground rods and ground conductors shall meet the requirements as specified or referenced to in section 918 of the current MDOT "2020 Standard Specifications for Construction".
- B. Anchor bolts. Shall be 3/4" diameter, of length specified by the pole manufacturer, and shall be installed by the CONTRACTOR at a bolt circle diameter recommended by the pole supplier. All anchor bolts and associated washers, nuts, studs, and couplings shall conform to the requirements of MDOT 2020 Standard Specifications for Construction, "Section 810" and "Section 908."

PART 3 - EXECUTION

3.01 PRE-PLANTING REVIEW

- A. Construction Methods. Foundations shall be installed per the detailed plans and shall meet the requirements as specified or referenced to in section 918 of the current MDOT "Standard Specifications for Construction".

PART 4 – METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. The work associated with BOLLARD LIGHT, FOUNDATION and UPLIGHT, FOUNDATION will be measured for payment by EACH. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment the Engineer shall observe site conditions with the owner for approval.

PART 5 – BASIS OF PAYMENT

5.01 PAYMENT

- A. Measurement and Payment. The completed work as measured for Bollard Light, Foundation and Uplight, Foundation will be paid for at the contract unit price for the following pay item. Four different light fixtures will be installed by the CONTRACTOR and have different foundation requirements. See lighting plans for more details.

ITEM NO.	Item	Pay Unit
330040.01	Bollard Light, Foundation	EA
330040.02	Bollard Light w/ 120V Power, Foundation	EA
330040.03	Uplight, Foundation	EA

END OF SECTION

WATER SERVICESECTION 33 12 10**PART 1 - GENERAL****1.01 DESCRIPTION**

For the unit prices bid for the various service items, the CONTRACTOR shall do all work and furnish all materials necessary to install new service lines from the new curb stop at the property line to the proposed water main where directed by the ENGINEER.

PART 2 - PRODUCTS**2.01 MATERIALS**

The service pipe shall be type K copper conforming to ASTM Specifications B88. Corporation cocks shall be made of bronze and shall have a clear opening of the diameter of the specified. 1" corporation cocks shall be located at the saddle connection to the water mains for all service connections. Clamps and saddles shall be made of bronze, stainless steel, or heavy cadmium plated combination of malleable iron and forged steel straps.

Curb stops shall be set at the property line or as directed by the ENGINEER and shall be constructed of bronze with a valve box and cover of the size recommended by the manufacturer.

All stop cocks, curb stops, clamps, and saddles yokes must be of the type currently used by the Village and must be approved by the Village prior to being ordered or incorporated into the project.

PART 3 - EXECUTION**3.01 WORK INCLUDED**

The item of Water Service Connection shall include the service clamp, corporation cock, curb stop, all required fittings, and all materials and work necessary for installation of the service connection from the proposed water main to the curb stop, all required excavation, backfill, etc. These items shall include everything except the new pipe required.

The item Water Service pipe shall include the pipe, of the diameter specified, as required to install the various water services from the proposed water main to a point designated by the ENGINEER. Pipe shall be installed by the open cut or by bore and jack as needed. No payment will be made for curb and gutter, sidewalk, or pavement removal or replacement on water services.

PART 4 - MEASUREMENT AND PAYMENT

The CONTRACTOR shall be paid his unit price for water service connection for each new water service of the diameter specified actually installed and shall be paid his unit price bid for per foot bid for each foot of water service pipe actually installed

ITEM NO.	DESCRIPTION	PAY ITEM
331210.01	Water Service, 2 inch	FT
331210.02	Water Service Connection, 2 inch	EA

SANITARY SEWERSECTION 33 13 00**PART I - DESCRIPTION****I.01 GENERAL**

Description

This work shall be performed in accordance with the most current MDOT Standard Specifications for Construction and shall consist of all labor, equipment and materials required to install the sanitary sewer at the locations shown on the plans or as ordered by the ENGINEER.

I.02 Work Included

The work under this item includes all materials, work and operations necessary to construct the sanitary sewer. This includes sewer pipe, fittings, temporary plugs, clearing and grading, tree removal, dewatering, earth excavation, joint materials, laying of pipe, backfill and disposal of excess material; protection of existing structures and utilities; cleanup and other operations necessary to complete the work as shown on the plans and as specified.

Part 2 - PRODUCTS**2.01 Pipe Materials**

All PVC Gravity Sewer Pipe with four foot of cover or more shall be SDR 26 conforming to the requirements of the latest revision of ASTM Specification D3034 "Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings". All PVC pipe joints shall be of the elastomeric gasket type providing a watertight seal. The bell shall consist of an integral wall section stiffened with two PVC retainer rings which securely lock the solid elastomeric ring in place. Joints shall conform with ASTM Specification D-3212. Any Gravity Sewer Pipe with less than four feet of cover shall be cement lined and asphalt coated ductile iron pipe.

2.02 Pipe Joints

All Pipe Joints must conform in all respects to the requirements of Division 2 Materials. Where reference specifications are used, they shall be considered as referring to the latest issue. When it is necessary to connect new pipe to existing pipe the connection will be made with the appropriate size Fernco. The Fernco connection unless specified shall be included in the payment for the new sewer pipe. When it is necessary to connect new pipe to existing structures, the connection unless specified shall be included in the payment for the new sewer pipe.

PART 3 - EXECUTION

3.01 Pipe Testing

All tests shall be under the supervision of the Engineer, Prior to connecting any active sewer services or extending services beyond the property line, unless specified otherwise, the new sewers and services shall be tested for alignment and leakage. All plastic pipes shall have mandrel testing performed 30 days after placement; the mandrill size shall be 95% of the manufacturers' actual inside diameter. The sewer shall be thoroughly cleaned before the Engineer is requested to witness or perform any tests.

3.02 Alignment

Sewers must be straight between manholes and will be tested for straightness by videotaping from manhole to manhole.

3.03 Leakage

Unless otherwise called for in the project specifications, the maximum allowable infiltration/exfiltration shall be 100 gallons per day, per inch of diameter, per mile of pipe for ASTM C-443 and ASTM C-425 joints. The joints shall be tight and any visible leakage in the joints and leakage in excess of that specified shall be repaired.

- A. Water Testing: The Contractor shall furnish, install and maintain a "V" notch weir, tightly secured to the low end of each section of sewer, so that the infiltration may be checked. When the infiltration is demonstrated to be within the allowable limits, the Contractor shall remove the weirs and all framing, leaving the sewers and manholes clean and free of any debris.

Exfiltration tests will be required only when the natural or induced ground water table is less than 2 feet over highest point in pipeline under test, including house services. Exfiltration tests shall be made by filling the line to a minimum depth of 2 feet above the high point of the line under test, with allowance for ground water level, and measuring the water required to maintain this level.

- B. Low Pressure Air Testing: The Contractor shall furnish all equipment and personnel to conduct an acceptance test using low pressure air. Pipe shall be cleaned and all outlets plugged and securely replaced before beginning test

PART 4 - METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. The work associated with SANITARY SEWER will be measured horizontally by the linear foot from center of manhole to center of manhole. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the owner for approval.

PART 5 - BASIS OF PAYMENT

5.01 PAYMENT

- A. The work associated with SANITARY SEWER shall be included in the unit Linear Foot price bid which includes materials, labor, equipment, transportation, and supervision necessary to complete the installation of items identified herein, and any incidentals necessary for completion of the specified herein as shown on the Contract drawings or as directed by the Engineer.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
333000.01	SANITARY SEWER	Feet

END OF SECTION

LOW PRESSURE AIR TEST

MINIMUM HOLDING TIME IN SECONDS REQUIRED FOR
PRESSURE TO DROP FROM 3-1/2 TO 2-1/2 PSIG

	PIPE DIAMETER													
	4"	6"	8"	10"	12"	15"	18"	21"	24"	27"	30"	33"	36"	39"
25	4	10	18	28	40	62	89	121	158	200	284	299	356	418
50	9	20	35	55	79	124	178	243	317	401	495	599	713	837
75	13	30	53	83	119	186	267	364	475	601	743	898	1020	1105
100	18	40	70	110	158	248	356	485	634	765	851	935		
125	22	50	88	138	198	309	446	595	680					
150	26	59	106	165	238	371	510							
175	31	69	123	193	277	425								
200	35	79	141	220	317									
225	40	89	158	248	340									
250	44	99	176	275										
275	48	109	194	283										
300	53	119	211											
350	62	139	227											
400	70	158												
450	79	170												
500	88													
550	97													
600	106													
650	113	170	227	283	340	425	510	595	680	765	851	935	1020	1105

6" SERVICE LEADS, WYES AND FITTINGSSECTION 33 13 10**PART 1 - DESCRIPTION****1.01 GENERAL**

Description

This work shall be performed in accordance with the current MDOT Standard Specifications for Construction and shall consist of all labor, equipment and materials required to install the six-inch service lead at the locations shown on the plans or as ordered by the ENGINEER.

1.02 Work Included

The work under this item includes all materials, work and operations necessary to construct the six-inch service lead from the wye or a proposed manhole near to a point at the ROW line or to a point within five feet of the building as noted on the plans or as directed by the Engineer. This includes sewer pipe, fittings, cleanouts, temporary plugs, clearing and grading, tree removal, dewatering, earth excavation, joint materials, laying of pipe, backfill and disposal of excess material; protection of existing structures and utilities; cleanup and other operations necessary to complete the work as shown on the plans and as specified. The wye connection and for the marina force main will also be included in this item.

Part 2 - PRODUCTS**2.01 Pipe Materials**

All PVC Gravity Sewer Pipe with four foot of cover or more shall be SDR 26 conforming to the requirements of the latest revision of ASTM Specification D3034 "Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings". All PVC pipe joints shall be of the elastomeric gasket type providing a watertight seal. The bell shall consist of an integral wall section stiffened with two PVC retainer rings which securely lock the solid elastomeric ring in place. Joints shall conform with ASTM Specification D-3212. Any Gravity Sewer Pipe with less than four feet of cover shall be cement lined and asphalt coated ductile iron pipe.

2.02 Sanitary Cleanout

6" risers shall be constructed on all leads and shall consist of a wye and a 45-degree elbow, sufficient 6" piping to extend to the ground service and a brass cap. Backfill shall be carefully placed and compacted around the riser in an approved manner which will not damage the sewer or the riser. Fittings and risers shall not be bedded in concrete.

PART 3 - EXECUTION

3.01 Fittings

The CONTRACTOR shall supply and install the necessary 6”-45-degree Bends, plugs, cap and other fittings which may be required for the installation of the sewer lead and cleanout. All such fittings shall be considered incidental to the respective sewer items and will not be measured for payment.

PART 4 - METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. The work associated with SANITARY SEWER LEADS AND CLEANOUTS will be measured horizontally by the linear foot. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the owner for approval.

PART 5 - BASIS OF PAYMENT

5.01 PAYMENT

- A. The work associated with SANITARY SEWER LEADS AND CLEANOUTS shall be included in the unit Horizontal Linear Foot price bid which includes materials, labor, equipment, transportation, and supervision necessary to complete the installation of items identified herein, and any incidentals necessary for completion of the specified herein as shown on the Contract drawings or as directed by the Engineer.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
331310.01	SANITARY SEWER LEADS AND CLEANOUTS	Feet

END OF SECTION

SANITARY MANHOLE, 4' DIA W/ FRAME AND COVERSECTION 33 13 20**PART I - DESCRIPTION****I.01 GENERAL**Description

The CONTRACTOR shall furnish all materials and do all work necessary to construct in place the manholes and appurtenances, complete and ready for operation, as shown on the plans, per specifications as specified, or as ordered by the ENGINEER.

I.02 Work Included

Included under these items shall be all earth excavation, backfill, sheeting, shoring, disposal of excess material, cleanup, and all concrete, reinforcing steel, masonry work, ductile iron steps, cast iron frames and covers, pipe and fittings, and all other work and materials necessary to complete the manholes and appurtenances as shown on the plans, as specified, and as ordered by the ENGINEER, except such work as is specifically included under other contract items.

PART 2 - PRODUCTS**2.01 Manholes**

Manholes shall be 4-foot in diameter and shall be constructed of precast concrete in accordance with the ASTM Specifications for "Precast Reinforced Concrete Manhole Risers and Tops", designation C-478. The minimum wall thickness shall be five (5) inches. Unless otherwise specified or shown on the plans, manhole tops shall be of the eccentric cone type. Precast flat covers and flat bottoms shall be a minimum of 8-inches thick reinforced with two layers of steel with a minimum area of 0.39 square inches per linear foot in both directions in each layer. Each section shall contain standard manhole steps constructed of ductile iron. Vertical manhole joints shall be of the "O" ring type. Drawings of the manholes must be submitted to the ENGINEER for approval prior to construction.

All manholes used on this project shall have flexible rubber gaskets cast in place for each sewer invert. The gaskets shall be installed so that the sewer pipe can be inserted through the use of a compression wedge or ring. The end result shall produce a watertight, flexible connection between the sewer and the manhole wall.

Note: Manhole steps shall be a corrosion resistant material meeting the load requirements of ductile iron.

2.02 Cast Iron Frames and Covers

All manhole frames and covers shall be of gray iron free from any blowholes, etc., and shall

conform to ASTM Designation A-48. All manhole covers shall comply with the local municipal specifications.

PART 3 - EXECUTION

3.01 FITTINGS

The CONTRACTOR shall supply and install the necessary Bends, plugs and other fittings which may be required for the installation of the sanitary manhole. All such fittings shall be considered incidental to the Sanitary Manhole item and will not be measured for payment

PART 4 - METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. The work associated with the SANITARY MANHOLE items will be measured separately for payment by EACH. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the owner for approval.

PART 5 - BASIS OF PAYMENT

5.01 PAYMENT

The work associated with the SANITARY MANHOLE items, shall be included in the unit Each price bid which includes materials, labor, frame and cover, steps, equipment, transportation, and supervision necessary to complete the installation of items identified herein, and any incidentals necessary for completion of the specified herein as shown on the Contract drawings or as directed by the Engineer.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
331320.01	Sanitary Manhole w/ Frame & Cover	Each
331320.02	Sanitary Manhole, Patch	Each
331320.03	Sanitary Manhole, Core and Seal	Each

END OF SECTION

PART I - GENERAL**I.01 RELATED DOCUMENTS**

- A. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section including, but not limited to, all Drawings, all Specifications, General Conditions, and General Requirements including submittals.

I.02 DESCRIPTION OF WORK

- A. This item shall consist of:
1. All labor, materials, equipment and tools necessary for the removal of the existing system as well as complete installation of electrical service components including service hookup, conduit, wiring, circuit boxes, junction boxes, switches, timers, photocells, final connection to fixtures, fastening hardware, anchor bolts, and related equipment and hardware to provide a complete working system as shown on the plans and as herein specified.
 2. This site electrical item shall consist of all labor, materials, equipment, tools, supervision, insurance and bonds necessary for the complete installation of the electrical conduit, equipment boxes, handholds, and appurtenances to provide wiring paths below grade to allow the site electrical contractor to install all the electrical wiring, equipment and connections without having to disturb grade to complete his work. Any conduit that penetrates the ground shall be terminated and plugged approximately 12 inches above grade. All equipment pads, embedments and grounding systems shall be placed by the contractor under this underground electrical item to allow the site electrical contractor to install equipment, pull wiring to and properly ground the equipment.
 3. The site electrical contractor is responsible for furnishing all labor, material, equipment, supervision, insurance and bonds for installing all electrical work required to have a complete and functional electrical system except for work performed by the underground site electrical contractor to prevent the need for ground disturbance by the site electrical contractor. This includes setting electrical equipment, such as transformers, switchgear, control boxes, light poles, etc. onto the prepared electrical pads, installing conduits for above grade work and connections to new and existing equipment, pulling all cable and making all wiring terminations, demolition of existing conduits, wiring, poles and other appurtenances no longer needed, energizing and testing of electrical equipment and systems. The site electrical contractor will be responsible for coordinating the work between the underground site electrical contractor, the municipal power provider and themselves.

I.03 CODES AND STANDARDS

- A. The Contractor shall obtain all permits, pay all fees, give all proper authorities all requisite notices and comply with all rules and regulations affecting this work.

- B. All materials and work shall conform to the latest editions of the following codes and standards as they apply:
1. National Electric Code (NEC) especially note Article 555.
 2. National Electrical Manufacturers Association Standards (NEMA).
 3. Underwriters Laboratory, Inc. (UL).
 4. American Society of Testing and Materials (ASTM).
 5. American National Standards Institute (ANSI).
 6. All local Building and Electrical Codes.
- C. It is the intent of the specifications and accompanying drawings that the system shall be furnished and installed complete. The Electrical Contractor shall furnish and install all the conduit, wire, boxes, equipment, devices and controls needed and usually furnished in connection with such work, whether specifically mentioned or not. All required street and driveway crossings shall be installed by directional drilling.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Raceway, Conduits and Fittings, shall be:
1. Rigid Nonmetallic Conduit (RNMC): Rigid nonmetallic conduit shall be U.L. listed in conformity with the requirements of NEC Article 347. Rigid nonmetallic conduit shall be Schedule 40, rigid heavy wall polyvinyl chloride, 90°C U.L. rated. Connectors and couplings shall be solvent weld type RNMC and shall be manufactured by "Carlton" or equal.
 2. Rigid Extra Heavy Wall Nonmetallic Conduit (REHWNMC): Conduit shall be same as RNMC above except that it shall be "Schedule 80 PVC" with a thicker wall and higher crush strength.
 3. Rigid Metal Conduit (RMC): Rigid galvanized conduit bearing the U.L. label and manufactured in accordance with ANSI C80.1-1966 (R1971). Minimum 1/2" trade size. Threaded fittings.
 4. Electrical Metallic Tubing (EMT): Thin wall type EMT bearing U.L. label and manufactured in accordance with ASA Specifications C80-3 in standard lengths. Minimum 1/2" trade size. Insulated throat connectors and couplings to be galvanized steel compression type 2" and below. Above 2" to be steel set screw type.
 5. Flexible Metallic Conduit (FMC): Flexible metal conduit to be U.L. approved 1/2" minimum trade size. Connectors to be insulated throat, malleable iron.
 6. Conduit Accessories: Provide conduit accessories including straps, hangers, expansion and deflection fittings, as recommended by the conduit manufacturer. Provide NEMA I enclosures for indoor application, NEMA 3R rain tight enclosures for outdoor or damp

locations or NEMX-4X (fiberglass reinforced polyester) for waterfront locations. All enclosures shall be suitable for padlocking.

7. Wiring shall be:

- a. All wire and cable to be U.L. approved, NEC standard. All conductors to be copper unless specifically noted otherwise.
- b. Copper Type THHN/THWN rated insulation, 600 Volt, 90° C rated standard copper size #12 up to and including #4 AWG.
- c. Copper Type THW rated insulation 600 Volt, 75° C rated standard copper size #4 AWG up to 500 MCM AWG.
- d. Bare Conductors shall be standard copper for all sizes.
- e. Direct Burial Cable shall be per code of the size and type required, copper conductor, minimum #12 wire size.

8. Panelboard Enclosures shall be:

- a. Enclosures shall be sheet steel NEMA outdoor general purpose unless noted otherwise, code gauge, minimum 16-gauge thickness, and with multiple knockouts.
- b. Provide doors with flush lock and key, all panelboard enclosures keyed alike, with concealed hinges and door swings as indicated.
- c. Equip each panelboard with an engraved Bakelite nameplate affixed to the outside of the cover, above the door, indicating the panel identification as referred to on the one-line diagram. Equip the interior of each door with a circuit-directory frame, typewritten card and clear plastic covering indicating all circuits.
- d. Provide covers with a painted gray enamel finish over a rust inhibitor. All covers shall have concealed mounting hardware with the cover closed. Enclosures shall be fabricated by the same manufacturer as the panelboards to be enclosed.
- e. Circuit Breaker Type panelboards shall be fused, molded case automatic air breakers with thermal- magnetic, ambient temperature compensated bolt on connection with non-interchangeability feature. Minimum breaker size is 20 amperes unless otherwise called for on the plans. Circuit breakers shall have a common simultaneous trip for 2 and 3 pole breakers. Circuit breakers shall be 120/240 Volt rated for 1 phase, 3 wire hookup, unless otherwise called for with a minimum short circuit rating of 10,000 RMS amperes symmetrical at 120/240 V AC. Use Square D or equal.

9. General

- a. Ground rods shall be provided in 10-foot lengths and a minimum of 5/8" in diameter. Connections of ground rods to ground wire shall be exothermic welds only, equal to or manufactured by Copperweld Bimetallics Division or ITT Blackburn. Bolted, clamped or screw type connections are not acceptable.
- b. Ground wire shall be factory fabricated wire, size #2/0. Wire shall be bare copper, stranded, dead soft annealed conductivity of 30 or 40% as manufactured by Copperweld Bimetallics Division.
- c. Exothermic welds shall be of factory built exothermic weld modules for the

- appropriate and recommended connection of the manufacturer, equal to or better than those manufactured by Cadweld.
- d. Photocells shall be Intermatic Model #K 1121 adjustable, magnetic relay type photocell with Lexan waterproof housing – 120 V AC, 60 Hz, 1500 'Watt Tungsten, for control of exterior lighting and outlets and as called for on the plans.
 - e. Programmable time clocks for outlet control shall be of the digital, electronic type installed as shown on the plans.
 - f. Junction and/or pull boxes shall be in accordance with NEC and UL requirements and of sufficient size and suitable design to meet the conditions involved. Construct boxes of code gauge sheet steel on an angle iron framework, treated, painted one prime coat with access to and clearance for pulling in all conductors. Make covers in sections for ease of handling and secure to the box by machine screws. Outlet box and fitting shall be suitable in every case for the apparatus or equipment mounted thereon or therein. Where standard boxes are not adequate provide special boxes. Boxes to have knockouts on all sides and back. Boxes shall be manufactured by Steel Village, Raco, Appleton or approved equal.
 - g. Solderless wire shall be constructed of an insulating material with metal insert as manufactured by Minnesota Mining Corporation or approved equal.

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS

- A. Wire and cables shall be carefully handled during installation so as to avoid mechanical injury to the conductor, insulation or covering. Joints and splices shall be made in an approved manner and shall be equivalent electrically and mechanically to the conductor itself. Wherever the conductor is bared for splicing, it shall be taped with a good grade of splicing compound and with friction tape so as to form the equivalent of the original insulation and covering.
 1. Provide sleeves in concrete construction as required. Provide the General Contractor with necessary information as to dimension and location of all openings required in concrete construction.
 2. Use no conduit smaller than 1" diameter. Not more than four (4) 90° bends in any run of conduit shall be permitted except by use of junction or pull boxes. No wire splices will be permitted in entire length of conduit or raceway.
 3. Close ends of all conduits with proper caps to exclude dirt and moisture during construction until wiring is pulled in.
 4. Make joints in conduit runs with standard couplings. Wherever conduits are jointed from opposite directions use Erickson couplings.
 5. Furnish and install all branch circuit wiring connecting all lighting fixtures, receptacles and all other electrical devices. All home runs for branch circuit wiring must be extended to the panelboard.
 6. Grounding of all conduit, metal frames, enclosures, main services ground, etc. shall be installed to meet all codes relating to this work.
 7. Install the top of driven ground rods and the copper wire and lead-ins between ground rods approximately 12" below finished grade.
 8. Install fixtures to maintain the alignments, spacing, layout and general arrangement indicated on the drawings, and in strict accordance with the manufacturers printed

instructions.

- B. At project completion and before final approval, the CONTRACTOR shall:
 - 1. Test all lights, controls and related equipment for compliance with requirements and proper operation.
 - 2. Aim adjustable fixtures as directed and observe and adjust at night as required for optimum performance.
 - 3. Replace all burned out and dimmed lamps.
 - 4. Clean interior of all fixtures, all lens and lamps.
 - 5. Completely paint all lighting equipment as per plans and details.
 - 6. Submit operating manuals for all equipment and systems necessary for proper operation and maintenance by OWNER.
 - 7. Touch-up all scratches or other imperfections that may have occurred during installation if approved by the Engineer.

C. ElectricalService

- I. Consumers Power is the local electric distributor and shall arrange to deliver the electrical service to the site meters. The CONTRACTOR shall coordinate with Consumers Power to make sure that the electrical service is installed when needed.

PART 4 – METHOD OF MEASUREMENT

4.01 MEASUREMENT

- A. The work associated with Site Electric System, Complete will be measured for payment by LUMP SUM. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment, the Engineer shall observe site conditions with the owner for approval.

PART 5 – BASIS OF PAYMENT

5.01.1 PAYMENT

The Contractor will be paid his lump sum price bid for Site Electrical System, Complete which price will be payment in full for all existing electric system removal, as well as wiring, service hookups, breakers, outlets, distribution circuits, panel boards, cabinets, wiring devices, boxes and fittings, conduits, conductors, raceways, controls, and all related items necessary to complete the installation, successfully test, startup and operate all electrical systems for this project.

ITEM NO.	ITEM	Pay Unit
331100.01	Site Electrical System, Complete	LS

MARINE - FUEL SYSTEM DEMOLITION

SECTION 33 20 00

PART I - GENERAL

I.1 REFERENCES AND STANDARDS

- A. The Michigan Department of Transportation (MDOT), Standard Specifications, as revised.
- B. The requirements of the Michigan Environment, Great Lakes and Energy (EGLE), as they relate to the handling of fuel systems.
- C. The requirements of the National Fire Protection Association (NFPA), as they relate to marine fuel systems.
- D. The requirements of the Michigan Department of Licensing and Regulatory Affairs (LARA), Bureau of Fire Services, as they relate to fuel systems.

I.2 DESCRIPTION

- A. Provide all labor, equipment and supervision necessary to complete the work specified in this section. All work in this section to occur after October 1, 2025, following the boating season of the adjacent marina.
- B. Scope of work includes:
 1. Complete Demolition, Removal, and Disposal of the existing marine fuel system which includes, but is not limited to, the underground fuel tanks (2 products), remote filling equipment, and all associated fuel piping, appurtenances, and electrical supplies up to the limits shown on the plans. The existing fuel monitoring and control wiring shall be salvaged and reused.
 2. Demolition, Removal, and Disposal of the concrete located at the existing fixed pier abutment that is covering the existing marine fuel piping system to allow for the installation of a new transition sump. The remaining fuel piping to be drained, flushed, and capped for future removal.
 3. Contractor to retain an environment consultant to test the soil beneath the existing fuel tanks for the presence of fuel or any contaminated soil in accordance with EGLE closure requirements. Contractor to submit testing report for Owner and EGLE review and approval prior to final closure of excavation.
 4. Contractor to provide all associated permits, approvals, closure reporting and chain of custody documentation for fuel tank, fuel line, contaminated soils removals (if required).
 5. Contractor to provide documentation to ensure all fuel system removal requirements are complete and in compliance with proper removal and clean closure.
 6. Contractor to remove and take possession of any unused fuel in the tanks prior to their removal following the end of boating season which ends on October 1.
- C. Related work specified elsewhere:
 1. Section 33 20 10, Fuel System, Complete

I.3 QUALITY ASSURANCE

- A. All demolition shall be performed as specified herein and as required by the general and special provisions of any permits issued by the EGLE.

I.4 SUBMITTALS

- A. Submit for approval:
 - I. Fuel Demolition and Removal Plan including proposed permitting, sampling, and soil erosion measures.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Silt Fence:
 - I. The Contractor shall use silt fence to isolate the removal of the existing fuel transition sump to contain any sediments. Disturbed areas shall received mulch blanket and seed per contract documents following removal and grading.

PART 3 - EXECUTION

3.1 GENERAL

- A. During demolition, the Contractor shall be required to observe and to comply with all laws of the United States, all requirements of the USACE, EGLE, and all local, state, and federal authorities in relation thereto.
- B. Bidders shall examine the site and make their own estimates of the types and quantities of demolition, which will be required to fulfill the Contract requirements to the limits shown on the drawing.
- C. All materials removed during demolition shall become the property of the Contractor unless otherwise noted.
- D. All materials removed during demolition, except those which are to be salvaged, shall be disposed of off the site in conformance with all municipal, state and federal regulations.
- E. Contractor shall use extreme caution during demolition operations and verify limits of required removal prior to proceeding with the work. Damage caused by the Contractor to the existing items, including, but not limited to docks, structures and pavement, shall be repaired by the Contractor as directed by the Engineer at no additional cost to the Owner.
- F. Contractor shall take appropriate measures to prevent any material from falling into the waters of the harbor (Lake Huron). Any material that falls in the water shall be removed immediately by the Contractor. The Contractor shall have fuel absorption pads on hand in the event any residual fuel is encountered during demolition.

- G. The Contractor is solely responsible for ensuring all transfer areas, structures, haul roads, public roads and other facilities are free from spilled material both during and after removal operations. Material temporarily stockpiled shall be adequately contained utilizing temporary barriers and appropriate erosion and sediment control measures as needed to prevent sediment from returning back to the marina and to site sewer systems. Temporary stockpile areas shall be cleaned and restored to preexisting conditions including, but not limited to, storm sewers affected by the project. Contractor responsible for restoring any damage to the site improvements including, but not limited to, signs, curb, and pavement resulting from the project to Owner’s satisfaction.

PART 4 – METHOD OF MEASUREMENT

4.1 FUEL SYSTEM DEMOLITION

- A. This work will be measured for payment on a lump sum basis.

PART 5 – BASIS OF PAYMENT

5.1 FUEL SYSTEM DEMOLITION

- A. The lump sum price for FUEL SYSTEM DEMOLITION shall include all materials, labor, equipment, transportation, survey control, sediment control, and supervision necessary to complete the items identified herein, and any incidentals necessary for completion of the work specified herein and as shown on the Contract drawings or as directed by the Owner.

5.2 PAYMENT ITEMS

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
332000.01	Marine Fuel System Demolition	Lump Sum

END OF SECTION

PART I – GENERAL

I.01 SUMMARY

- A. Furnish and install a fully functional fuel handling system that connects to a new southern transition sump location and extends north, upland of the existing seawall, along the waters edge to a new transition sump location at the existing fixed pier abutment and connects to the existing marine fuel system on the fixed pier. This work includes all items as indicated on the drawings or described in these specifications, and all other items needed for a complete and proper installation, outlined as follows:
1. Review and understand the existing fuel system complete with all fuel controls and monitoring systems. Coordinate with the fuel system demolition work in Section 33 20 00.
 2. Prior to installation. Schedule and coordinate all fuel system requirements, provisions and accommodations, including electrical requirements, with all other work occurring onsite. Ensure that all fuel system components will integrate into the marina services building.
 3. Contractor responsible for securing, and complying with, all required permits from EGLE, LARA, and any other applicable agencies for the installation of the new fuel system.
 4. Contractor responsible for furnishing and installing all fuel components shown on the plans including, but not limited to, all fuel tanks, remote fill systems, venting, electrical, piping systems, controls, sumps, boots, and any materials required for a complete installation.
 5. Contractor is responsible for any dewatering needed for installation of the new fuel system including any required dewatering permits.
 6. Furnish and install new at-grade fuel transition sump, with code-compliant top, in the location of the existing fuel system's landside connection at the fixed pier abutment and connect to existing system.
 7. Include all new sensors, valves, and controls required at the sumps, connect to existing monitoring system conduit. Repair and replace any existing concrete sidewalk as needed following installation.
 8. Furnish and install new electrical control circuit on the existing fixed dock systems to connect the existing emergency shutoff switch on the service pier with the new upland fuel system in accordance with the plans.
 9. Furnish and install all electrical work as required for fuel system equipment connections to electrical supply in the existing marina services building.
 10. Furnish copies of all testing reports, certifications and permits required and registration required by EGLE, LARA, and any other agency for initial system startup. Assist Owner with any required paperwork.
 11. If fuel tank testing requires the filling of both newly installed diesel and recreational gas tanks, it will be the responsibility of contractor to purchase/fill tanks with appropriate summer blend fuels that meet vapor pressure standards.
 12. Fuel System Improvements must be fully operational with summer fuel as soon as fuel supply is available, but no later than June 1, 2026.
 13. There will be a penalty of \$1,500 per day for each day that the fuel system is not operational beginning June 1, 2026.

I.02 SUBMITTALS

- A. Comply with the provisions of Section 01 00 00 General Requirements.
- B. Within 30 calendar days after award of Contract submit:
 - 1. Complete materials list of all items proposed to be furnished and installed under this Section. Furnish approval letters from EGLE and/or LARA for every piece of equipment and material to be furnished and installed on this project. List shall include, but not limited to:
 - a. Fuel tanks
 - b. Remote fills
 - c. Valves and sensors
 - d. Penetration boots
 - e. Underground piping
 - f. Transition Sumps
 - 2. Catalog cuts and other data required to demonstrate compliance with the specified requirements. Information to include proposed signage details.
 - 3. Materials as specified herein must be pre-approved by applicable departments of EGLE and/or LARA.
 - 4. Furnish proof of certified installer from manufacturer and State of Michigan.
 - 5. Furnish proof of required pollution liability insurance with limits not less than one million dollars per occurrence. All other insurance and certifications as required by EGLE and/or LARA for the installation of the fuel systems.
 - 6. Provide Owner with Operation Procedure (Including seasonal start-up and shut-down instructions), Testing Procedure and Compliance Report, and Warranty Letter prior to final acceptance.

I.03 QUALITY ASSURANCE

- A. Use certified fuel handling system installer and competent supervisors in execution of this portion of the work who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper installation of the work of this section.
 - 1. In the acceptance or rejection of the installed fuel handling system no allowance will be made for lack of skill or experience on the part of workmen.
 - 2. The fuel system must be installed and tested by a certified installer of the manufacturer and in accordance with State of Michigan regulations.
- B. Codes, regulations and standards:
 - 1. All work and materials must be in conformity with all federal and state codes, laws, and regulations as well as the current Michigan Flammable Liquid Regulations, EGLE, LARA, and National Electrical Code (2023).
 - 2. Where requirements of the contract documents exceed those of above-mentioned codes, regulations and standards, the requirements of the Contract Documents must govern.
 - 3. The Contractor must pay for all required permit, fees, and inspections.

I.04 PRODUCT HANDLING

- A. Comply with provisions of Section 01 00 00 General Requirements.

PART 2 – PRODUCTS

2.01 MARINE FUEL SYSTEM MATERIALS

- A. All fuel system materials will be as indicated on the drawings and all other materials not specifically described, but required for a complete and proper installation of the work of this Section, will be of first quality of their respective kinds and as selected by the Contractor subject to the approval of the Professional and applicable regulatory agencies.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Thoroughly review and understand the existing fuel system completely, prior to the start of any work.

3.02 INSTALLATION

- A. Install the work and materials of the Section in strict accordance with the requirements of the manufacturer and State of Michigan, EGLE and LARA, and as approved by the Professional.
- B. Furnish all copies of all code inspections and approvals and furnish installer certificates as specified and as required by the State of Michigan, EGLE and LARA.

3.03 FUEL HANDLING SYSTEM

- A. The furnishing and installing of the fuel handling system must be in accordance with the current State of Michigan, EGLE and LARA requirements and as noted on the plans.

3.04 TESTING

- A. Fuel handling system Contractor must furnish certification of all testing as required by Section 01 00 00 General Requirements and as specified in this section.
- B. Furnish all test pumps, gauges, equipment, and personnel required, and test as necessary to demonstrate the integrity of the finished installation to the approval of all pertinent authorities, the Owner and the Professional.
 - a. All piping and testing shall comply with all State of Michigan Rules and Regulations and these Specifications.
 - b. All pressure testing shall be as recommended by manufacturer.
- C. All piping shall be tested for leaks under hydrostatic pressure of 70 psi. Any and all leaks shall be found and corrected. No leakage is permissible. Test shall last 2 hours. In the event of any leakage found, leak shall be found and corrected. System shall be retested until satisfactory test are made at no additional cost to the Owner.
- D. Test all valves, cycling between closed-to-open-to-close positions while the valve is under pressure. Test all automatic valves for proper operation at the settings indicated.
- E. Contractor to test and document pre-existing flow and existing flow once new system is fully functional. Contractor to ensure that flow rates of new system meet or exceed those of the

existing system. Contractor to coordinate pre-existing flow testing with the fuel demolition work in Specification Section 33 20 00.

3.06 CLEANING AND FINISHING

- A. Before the Owner places fuel in piping systems the Contractor must clean piping and leave all in a clean working order at the end of the work.
- B. The Contractor must remove all rubbish and dirt from the premises where such rubbish has accumulated as a result of his work or workmen.
- C. Upon completion of the installation of the fuel operation, emergency shut-off systems and prior to the Owners operation of the system; the Contractor must perform a demonstrational walkthrough with the Owner and the Professional and must actually demonstrate each system's operation including winter shut-down and spring start-up procedures. The Contractor must prepare and hand out pertinent system information related to the demonstrations. The Contractor must prepare a demonstration meeting attendance record form that will be signed by all personnel from all parties present at the demonstrational walkthrough for each of the systems. The demonstration meeting attendance record form will be submitted as a project submittal and will be included in the project operation and maintenance manual.

3.07 OPERATION AND MAINTENANCE DATA

- A. Provide complete installation, operation and maintenance instructions, including seasonal startup and shutdown instructions, as specified in the Specifications. Perform an instructional walkthrough with the Owner to show them how to operate the system and complete a transaction.

3.08 GUARANTY-WARRANTY

- A. Furnish 1-year standard warranty for all work and material as required by these documents.

PART 4 – METHOD OF MEASUREMENT

4.01 GENERAL

- A. This work will be measured per a Lump Sum Basis. The system will be measured in two parts with the Marine Fuel System, Complete including the portion from the new tanks up until the new southernly transition sump. The remaining connecting piping and northernly transition sump to the existing fuel system will be measured as Marine Fuel System Connector, Complete.

PART 5 – BASIS OF PAYMENT

5.01 MARINE FUEL SYSTEM

- A. The Lump Sum price for MARINE FUEL SYSTEM, COMPLETE and Lump Sum price for MARINE FUEL CONNECTOR, COMPLETE shall include all materials, labor, equipment, transportation, survey control, design, coordination with other trades and contracts, and supervision necessary to complete the installation of the marine fuel handling system including all components as described in this section, shown on the plans, required by the regulatory

agencies, and any incidentals necessary for completion of the work specified herein and as shown on the Contract drawings or as directed by the Owner.

5.02 PAYMENT ITEMS

Payment will be made under:

Item Number	Item	Pay Unit
332010.01	Marine Fuel System, Complete	Lump Sum
332010.02	Marine Fuel Connector, Complete	Lump Sum

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 GENERAL PROVISIONS

- A. General:
1. "Provide" means furnish and install.
 2. The provisions of this section shall apply to other work specified in Division 22 - Plumbing.
 3. Submit equipment and product submittals to Engineer for approval prior to construction.
 4. Commission all mechanical systems as specified and required.
 - a. Make sure all plumbing systems are properly tested, balanced, and placed into operation.
 - b. Provide Operation and Maintenance Manuals.
 - c. Train the Owner's personnel in the operation and maintenance of all equipment as required.
 - d. Provide "as-built" red lined drawings indicating final locations, routing, sizes, etc., of all mechanical equipment, ductwork, piping, sensors, etc.

1.3 PLUMBING WORK SCOPE SUMMARY

- A. General:
1. Furnish all materials, supplies, equipment, tools, transportation and facilities, and perform all labor and services necessary for the complete installation of the mechanical systems as shown on the drawings, as herein specified, and as required to make complete and operating systems.
- B. New Work
1. Provide new backflow preventer assembly, piping system, etc. New domestic water service including water meter to be provided by Civil Trades. Coordinate with site work contractor for new water connections.
 2. Provide 1-1/2" underground cold water supply for outdoor foot showers stubbed 5 feet beyond building for continuation by site work contractor.
 3. Furnish two (2) new outdoor foot showers specified on plumbing drawings for installation by others.
 4. Provide all faucets, p-traps, stop valves, drains, and new plumbing fixtures including water closets, lavatories, sinks, outdoor drinking fountains, wall hydrants, etc., as shown on the drawings and as specified in Section 22 01 00.
 5. Provide fixture hangers and carriers as indicated on plumbing fixture schedule.
 6. Where fixtures are electronic, provide all cables and adapters to make complete systems. Coordinate junction box installations with electrical contractor.
 7. Provide new sanitary piping, vents, cleanouts, trench drains, floor drains, etc., as shown on the drawings and as specified in Section 22 01 00. Provide sanitary piping above and below slab and new exterior sanitary piping to five feet beyond the exterior wall as shown. Coordinate installation of sanitary piping with the Site Work contractor's route to the main utility piping. Refer to site drawings and specifications for additional information.

SECTION 22 00 00
PLUMBING GENERAL PROVISIONS

8. Provide new domestic cold water piping systems including all piping, valves, fittings, etc., to all fixtures as shown on the drawings and as specified in Section 22 01 00.
9. Provide new domestic hot water heaters, expansion tank, piping, insulation, and thermostatic mixing valves at new sinks. Include all piping, valves, fittings, etc., to all fixtures as shown on the drawings and as specified in Section 22 01 00.
10. Provide domestic cold and hot water piping systems that are drainable for winterization. Include sloped installation of piping and drains at low points to allow both hot and cold systems to be drained.
 - a. Refer to Winterization Notes on the plumbing drawings for information about piping layout to allow partial winterization.
11. Provide piping insulation per Section 22 07 00.

1.4 INTENT

- A. The intent of this division is to call for finished work, tested and ready for operation.
- B. Furnish all materials, supplies, equipment, tools, transportation and facilities, and perform all labor and services necessary for the complete installation of the mechanical systems as shown on the drawings, as herein specified, and as required to make complete and operating systems.
- C. The work shall also include the completion of such details of mechanical work not mentioned or specifically shown, but which are necessary for the successful operation of all mechanical systems.

1.5 CODES

- A. Where standards or codes are mentioned, the latest edition or revision in force shall be followed.
- B. Contract documents shall take precedence when they are more stringent than codes, ordinances, standards, and statutes. Codes, ordinances, standards and statutes shall take precedence when they are more stringent or conflict with the drawings and specifications.
- C. All plumbing work shall be installed as required per all relevant codes. If the Contractor believes the drawings and specifications are contrary to code, they shall stop work and notify the General Contractor and Engineer immediately.

1.6 PERMITS AND INSPECTIONS

- A. Secure and pay for all permits, inspections, tests and fees required for the work to be performed.
- B. Upon completion of the work, furnish inspection certificates as normally issued in connection with the work.

1.7 DRAWINGS AND SPECIFICATIONS

- A. Schedules shown on drawings are for convenience and not intended to be a count of equipment, fixtures, etc. Each supplier shall make a separate count of these items and shall be required to furnish the equipment, fixture and materials wherever shown on the drawings but not included in the schedule.

- B. Drawings show arrangement, general design and extent to the systems and are diagrammatic except where in certain cases they are detailed giving exact locations and arrangement.
- C. Drawings are not intended to be scaled for rough-in dimensions. Where shop drawings are required for this purpose or field measurements are needed for the installation, they shall be prepared by the installing contractor.

1.8 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Shop Drawings: Prior to delivery of any material to the job site, the Contractor shall submit shop drawings for review by the Engineer.
- C. Substitutions: See Part 2 of this section.
- D. Operating and Maintenance Instructions:
 - 1. Upon completion of all work and tests, instruct the Owner in the operation and maintenance of all components.
 - 2. Furnish sets of written Operation and Maintenance Data per Division 1.

1.9 RECORD DRAWINGS

- A. The Contractor shall be responsible to maintain a complete and accurate set of marked up drawings during construction. Markups shall record any and all changes or deviations from the contract drawings.
- B. Record drawings shall be delivered to the Engineer after completion of the work as a permanent record of the installation as actually constructed.

1.10 CONTRACTOR RESPONSIBILITY

- A. Each Contractor all be responsible for the safety and good condition of all work and materials in Contract until its completion.
- B. Assume entire responsibility for all the materials, workmanship and satisfactory performance of the systems installed. It is not intended to limit or restrict the Contractor to the use of materials and manner of shop fabrication or erection that is not in accord with best standard practice.
- C. It is also not intended that the drawings or this Specification indicate or specify each item or material which is required to complete a satisfactory installation. Where such items are required and they are considered to be the accepted trade practice to provide same, they shall be considered to be both specified and indicated.
- D. The design and construction of all equipment and materials specified herein shall conform in all details with the latest revised codes of the American Society of Mechanical Engineers, the American Standards Association, American Society of Heating, Refrigeration, and Air Conditioning Engineers, and all existing laws, ordinances and requirements of the State.

1.11 DELIVERY, STORAGE AND HANDLING

- A. Protect all materials and equipment during delivery and during storage on site. Store materials and equipment on suitable blocking to maintain parts clear of the ground and to insure drainage of all rainwater.

1.12 COORDINATION AND COOPERATION

- A. Submit to and obtain from trades concerned, copies of shop drawings and catalog data of work which connects with or affects their work.
- B. Make arrangements with other trades as required to properly correlate installation into the overall project.
- C. Each Contractor shall be responsible for establishing elevations and routing of piping to correlate the work with other trades.
- D. Coordinate location and arrangement of equipment, piping, etc. In case of interferences between various items, or if simplified construction procedures are possible by relocation or changes in arrangement, change may be made if approved by the Engineer in writing.

1.13 PRODUCT WARRANTY

- A. Warranty all labor, materials, and labor for a period of one (1) year from date of final acceptance.
- B. Alterations, repairs, or replacement of defects in materials, equipment, and labor shall be borne by the Contractor at the Contractor's expense.

1.14 MAINTENANCE AND SERVICE ACCESSIBILITY

- A. Install equipment and piping to permit service and maintenance to all parts of the systems installed. Minor deviations from the drawings may be made to provide proper accessibility, but any major change will require written approval.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Where more than one type is indicated, selection is Contractor's option or compliance with governing regulations.
- B. Size system drain piping as shown or, if not shown, as required to properly drain piping systems, including valves and equipment.
- C. Manufacturer's equipment used as basis of design for project is name indicated in Specifications for particular type of equipment or application contained in these contract documents. If no manufacturer is listed, basis of design is industry standard indicated.

2.2 MATERIALS, EQUIPMENT AND WORKMANSHIP

- A. All materials shall be new and shall be prepared, fabricated and installed with skill and workmanship as is commonly considered to be the best in the trade involved. Work shall be performed at such times as will be best for the proper conduct of the entire project.
- B. The Engineer shall notify the Contractor of rejected or faulty work upon discovery, but this failure to detect omissions or violations of the Contract will not act as a waiver of the right to demand correction of defects in materials or workmanship.

2.3 SUBSTITUTION OF MATERIALS AND EQUIPMENT

- A. Certain materials and equipment are specified by manufacturer or trade name and catalog or model number to establish standards of quality, performance, design and suitability for intended use. The products of other manufacturers may be authorized by the Engineer if they are equal to those specified as determined by the Engineer and so approved in writing by the Engineer.
- B. If the Contractor provides equipment or materials listed in the specifications as "equal" or otherwise obtains written approval from the Engineer for a product substitution that is different from the listed design basis or specified equipment manufacturer and model number, it shall be the Contractor's responsibility to coordinate its installation with the work of all other trades and with the space available. The Contractor shall also pay for any changes caused to other trades as a result of the substitution.

2.4 EQUIPMENT SUPPORTS

- A. Provide the supports and hangers for equipment installed under this work. Where equipment is to be suspended from the roof steel, provide intermediate support members such that the load is carried at the panel points of the joists or trusses.

2.5 COMPONENTS AND REVISIONS

- A. Components normally furnished with equipment shall be considered as part of the specification whether specifically mentioned or not. Any revision necessary due to substitution shall be the responsibility of the Contractor without extra cost to the project.

PART 3 - EXECUTION

3.1 EXAMINATION OF PREMISES

- A. Verify site conditions under which this work must be conducted prior to commencing. Contractor shall be held to have examined the premises and shall be satisfied and fully conversant with all conditions. No claim for additional compensation due to Contractor's failure to make this evaluation are allowed.
- B. Examine all spaces, surfaces, and areas to receive the work. Do not proceed until corrections, if any required, have been made.
- C. Verify dimensions, elevations, grades and obtain all measurements required for proper execution of the work.

- D. Verify points of connections to utilities prior to start of construction and report any inconsistency before commencing work.

3.2 INSTALLATION REQUIREMENTS

- A. Each subcontractor shall have in charge of work a competent, experienced superintendent who shall be qualified for the work to be performed.
- B. Coordinate and schedule the work with other trades to properly expedite the completion of the project. Consult with other trades so that they are informed for coordination of all services.
- C. Equipment shall be set in place when necessary prior to enclosing the spaces. Any equipment which will not enter the normal openings provided or which will not fit into the designated areas will not be acceptable.
- D. Equipment shall be cleaned, aligned to tolerances specified by equipment manufacturer, and lubricated prior to start-up. Flush piping, valves, strainers, and similar devices. Adjust systems for proper operation.
- E. Perform system adjustments and place all equipment in operating condition. Obtain the services of approved factory trained technicians where specified in this division to start the equipment in accordance with factory recommendations.

3.3 CLEARANCES AND MAINTENANCE ACCESS

- A. Equipment shall be installed so that maintenance and replacement can be performed without the removal of other equipment.
- B. Clearance around pumps, coils, fans, air conditioners, etc., shall be provided for operation, maintenance, replacement, repair and removal.
- C. Piping connections to equipment shall be made with valves, unions, or flange fittings to permit their repair or removal without causing damage to piping or equipment.
- D. Install all ducts, piping, conduit, wiring, switches, panels, fixtures, etc., to accommodate any obstacles anticipated or encountered during construction. Determine exact route and location of ductwork, piping or raceway prior to fabrication.
- E. Prior to shop fabrication of ductwork, piping, conduit, etc., make field measurements and make shop drawings to check for clearances and interferences.
- F. Due to the scale of drawings, all required fittings, offsets, elevation changes, and routing are not shown. The intent of these drawings and specifications is that these shall be installed without additional cost.
- G. Maintain proper headroom and pitch of lines.

3.4 OPENINGS

- A. Provide openings in walls, ceilings, floors or roofing which are part of the existing construction as required for the installation of the work.

- B. The location and size of all openings shall be the responsibility of each subcontractor for the trade involved.
- C. Install and provide sleeves, inserts, panels, raceways, boxes, curbs, etc., ahead of the work to be performed.
- D. Openings shall be neatly patched after installation of the work.
- E. Flash and counterflash where mechanical equipment passes through waterproofed walls, floors, and roofs.

3.5 CUTTING AND PATCHING

- A. Cutting shall be avoided whenever possible, but any cutting required in the new construction shall be performed by the Contractor under the direction of the General Contractor.
- B. Where piping, ductwork, conduit, etc., must pass through walls, floors or other building components, the Contractor shall provide reinforcement or support adjacent to the opening to compensate for the removal of any support material.

3.6 GENERAL CLEANING

- A. Upon completion of the work, leave all surfaces broom clean and vacuum all ductwork, piping, conduit external surfaces.
- B. The entire installation shall be thoroughly free from oil and grease, dust and dirt, and any other foreign matter.
- C. Special cleaning methods shall be described in individual sections of this specification.

3.7 REMOVAL OF RUBBISH

- A. Remove on a daily basis all rubbish, debris, dirt, cartons, materials, etc., resulting from the work. Remove during construction to keep dirt accumulation to a minimum.

3.8 PROTECTION

- A. Protect all work from damage and protect the Owner's property from injury or loss during the performance of the work.
- B. Properly protect adjacent property as provided by law and the contract documents. Provide and maintain all passageways, guard fences, lights, and other facilities for protections required by local conditions.
- C. Any damage shall be repaired to original condition and acceptable to the Owner.

3.9 LEAK DAMAGE

- A. Damage caused by leaks in any of the equipment or piping installed by the Contractor to the building or to the work of other Contractors or to the contents, etc., shall be repaired by the Contractor who caused such damage at the Contractor's expense.

3.10 STARTUP AND COMMISSIONING

- A. The Contractor shall start up and test all new plumbing systems.

3.11 OWNER TRAINING

- A. After all plumbing systems have been successfully started and tested, the plumbing contractor shall provide Owner training.

3.12 PROJECT CLOSEOUT DOCUMENTS

- A. Provide closeout documents as described within this section and in Division 1.

PART 4 - METHOD OF MEASUREMENT

4.1 GENERAL

- A. The work associated with plumbing shall be incidental to Specification 331500.01 Restroom and will not be measured separately for payment. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment, the Engineer/Architect shall observe site conditions with the owner for approval.

PART 5 - BASIS OF PAYMENT

5.1 PAYMENT

- A. Plumbing within building footprint shall be included as part of Pay Item 331500.01 Restroom Building.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 SECTION INCLUDES

- A. Work of this section includes plumbing piping, equipment, fixtures, water heaters and trim, piping supports, piping specialties, valves, and related items for plumbing.

1.3 RELATED SECTIONS

- A. Section 22 00 00 - Plumbing General Provisions.
- B. Section 22 07 00 - Insulation - Plumbing.

1.4 SUBMITTALS

- A. Submit under provision of Division 1.
- B. Submit product data information on:
 - 1. Water Heaters
 - 2. Floor Drains
 - 3. Cleanouts
 - 4. Valves
 - 5. Fixtures, faucets, p-traps, trim, carriers, and auxiliaries.
- C. Product data for piping, including clear indications of the intended service or system.
- D. Shop drawings for pipe hangers.

1.5 APPLICABLE CODES AND REGULATIONS

- A. Michigan Plumbing Code - 2021.
- B. Piping installation and testing shall be per applicable sections of the national standards:
 - 1. Building Services Piping: ASME/ANSI B31.9.
 - 2. Plumbing Systems: ASME/ANSI A112.1.2, A112.6.1M, A112.14.1, A112.18.1M, A112.19.1M, A112.19.2M, A112.19.3M, A112.19.4M, A112.19.5, A112.19.7M, A112.19.8M, A112.21M, A112.21.2.2M, A112.21.3M, A112.26.1M, and A112.36.2M.

PART 2 -PRODUCTS

2.1 PLUMBING FIXTURES

- A. Acceptable Manufacturers:
 - 1. Unless noted otherwise, acceptable manufacturers are American Standard, Chicago Faucets, Elkay, Kohler, Sloan, Zurn, and T&S Brass, or as listed below.

2. Fixtures for entire project shall be product of one manufacturer. Fittings of same type shall be product of one manufacturer.
- B. Water Closets
1. See Plumbing Fixture Schedule on drawings.
 2. Provide with wall carrier.
 3. Provide all transformers, cables, and connectors required for a complete installation.
- C. Urinals:
1. See Plumbing Fixture Schedule on drawings.
 2. Provide with wall carrier.
 3. Provide all transformers, cables, and connectors required for a complete installation.
- D. Public Lavatories:
1. See Plumbing Fixture Schedule on drawings.
 2. For wall mounted units, provide with concealed wall bracket or wall carrier as scheduled.
 3. Provide with offset grid strainer, trap, and faucet trim for a complete installation.
 4. Provide with thermostatic mixing valve. Mixing valve shall be listed under ASSE Standard 1070 for single fixture applications. Watts Series USG-B, or equivalent as determined by the Engineer and Owner.
 5. Provide barrier free lavatory insulation kit equivalent to LAVGUARD as manufactured by Truebro or approved equal, with p-trap cover and two angle valves and supply stops, and as required for thermostatic mixing valve, white.
- E. Sinks:
1. See Plumbing Fixture Schedule on drawings.
 2. Provide with strainers, trap, and faucet trim for a complete installation.
- F. Drinking Fountains and Outdoor Showers:
1. See Plumbing Fixture Schedule on drawings.
 2. Provide with strainers, traps, and trim for a complete installation.

2.2 DOMESTIC COLD WATER SYSTEM

- A. Piping:
1. Above Ground Interior 3 Inches and Smaller: Type L hard drawn, seamless, copper tubing, conforming to ASTM B88. Fittings shall be sweat type wrought copper, ANSI B16.22. Tees formed into mains are not allowed.
 2. Buried: Type K light drawn or annealed, seamless, copper tubing, conforming to ASTM B88. Fittings shall be flared or compression, conforming to ANSI B16.26.
 3. Acceptable Manufacturers: Apollo-Conbraco, Febco, Watts, or equal.
- B. Backflow Preventers:
1. Water Service Supply - Reduced Pressure Zone Valve. Model: Watts LF009-QT-S.
 2. Acceptable Manufacturers: Apollo-Conbraco, Febco, Watts, or equal.
- C. Water Hammer Arresters:
1. Size according to the fixture unit method as determined by the Plumbing and Drainage Institute.
 2. Acceptable Manufacturers: Josam, Smith, Wade, Zurn, or equal.

- D. Wall Hydrants:
1. 3/4 inch outlet, and of proper length for wall thickness with removable stem operator.
 2. Wall hydrant runs shall be equipped with stop valves.
 3. Refer to Plumbing Fixtures Schedule on drawings.
 4. Manufacturers: Nibco, Watts, Woodford, or equal.
- E. Hose Bibb - Plumbing Chase
1. Rugged forged brass body and aluminum tee handle quarter turn hose bibb complete with vacuum breaker and quick disconnect coupling.
 2. Model: Watts LFBD-QT with Watts LF8 hose connection vacuum breaker.
 3. Manufacturers: Nibco, Watts, Woodford, or equal.
- F. Hose Bibb - Restrooms
1. Refer to Plumbing Fixtures Schedule on drawings.
 2. Manufacturers: T&S Brass, Chicago Faucets, or equal.

2.3 DOMESTIC HOT WATER SYSTEM

- A. Piping:
1. Above Ground Interior 2 Inches and Smaller: Type L hard drawn, seamless, copper tubing, conforming to ASTM B88. Fittings shall be sweat type wrought copper, ANSI B16.22. Tees formed into mains are not allowed.
 2. Buried: Type K light drawn or annealed, seamless, copper tubing, conforming to ASTM B88. Fittings shall be flared or compression, conforming to ANSI B16.26.
- B. Water Heater (Electric Storage Type):
1. See Plumbing Fixture Schedule on drawings.
 2. Storage Tank: glass-lined, insulated. Tank test pressure 300 psi and working pressure 125 psi.
 3. Elements UL approved immersion type.
 4. Provide ASME automatic resetting temperature-pressure relief valve with capacity ten percent greater than the water input.
 5. Acceptable Manufacturers: Bradford White, Lochinvar, A.O. Smith, Ruud, or equal.
- C. Domestic Hot Water Expansion Tank:
1. See Plumbing Fixture Schedule on drawings.

2.4 SOIL & WASTE PIPING SYSTEM

- A. Piping:
1. Buried interior soil and waste lines and exterior lines within five feet of building walls, cast iron soil pipe, or PVC DWV industrial drainage pipe.
 - a. Cast Iron Soil Pipe: Shall conform to ASTM A74, with bell and spigot type Tyler TY-Seal joints and fittings, or CISPI Specification 301 with hubless joints and fittings, thoroughly coated inside and out with coal tar varnish and bearing the insignia of the Cast Iron Institute.
 - b. PVC Plastic Pipe: Shall be Schedule 40 PVC conforming to ASTM D1785. PVC pipe fittings shall be Schedule 40 conforming to ASTM D2466, solvent welded type. ASTM D2564 for solvent cement.
 - c. Drain, Waste, & Vent (DWV) Pipe: Shall be solvent-cement joint PVC pipe conforming to ASTM D2729. DWV fittings shall conform to ASTM D3311.
 2. Above grade soil and waste lines and vent lines, cast iron soil pipe, PVC, galvanized steel pipe, or DWV industrial drainage pipe.

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- a. Cast Iron Soil Pipe: Shall conform to CISPI 301 with hubless joints and fittings, thoroughly coated inside and out with coal tar varnish and bearing the insignia of the Cast Iron Institute. If soil pipe requires painting, do not apply coal tar varnish.
 - b. PVC Plastic Pipe: Shall be Schedule 40 PVC conforming to ASTM D1785. PVC pipe fittings shall be Schedule 40 conforming to ASTM D2466, solvent welded type. ASTM D2564 for solvent cement.
 - c. Galvanized Steel Pipe: Shall conform to ASTM A53, Type E, electric resistance welded, Grade B, Schedule 40, with screwed joints and 150 pound malleable galvanized fittings. Elbows to be long radius design. Victaulic type joints and fittings are acceptable.
 - d. Drain, Waste, & Vent (DWV) Pipe: Shall be solvent-cement joint PVC pipe conforming to ASTM D2729. DWV fittings shall conform to ASTM D3311.
3. Set riser stack base fittings on a concrete or brick base on compacted soil.
- B. Floor Drains and Trench Drains:
1. See Plumbing Fixture Schedule on drawings.
 2. Provide trap seal device for all floor drains.
 3. Acceptable Manufacturers: JR Smith, Zurn, Josam, MIFAB, Wade, Watts, or equal.
- C. Cleanouts:
1. Locations: At each 90 degree bend in suspended and underground waste and drain pipes, at 50 foot intervals in straight runs, at base of each downspout and riser, above P-traps, and elsewhere as shown.
 2. Exposed Concrete Floor Areas: Sectional cast iron with serrated cut off section, brass head plug with cover.
 3. Finish Floor Areas: Same as exposed concrete floors except head plug raised brass and brass scored cover plate. Coordinate with floor finish.
 4. Finish Wall Areas: Cast brass countersunk plug, polished brass cover plate secured to plug with counter sunk screws.
 5. Concealed Suspended Pipe: Wye branch with raised brass plug.
 6. Acceptable Manufacturers: JR Smith, Josam, MIFAB, Wade, Watts, or equal.
- 2.5 UNIONS AND COUPLINGS
- A. Size 2 Inch and under: 150 psi malleable iron, bronze to iron ground joint unions for threaded ferrous piping. Provide all bronze couplings for copper piping.
- B. Dielectric Unions: lead-free certified to NSF/ANSI 372, rated for 250 psi (ANSI B 16.39). Galvanized steel body and nut, nylon insulator, low lead brass tailpiece and EPDM gaskets. Zurn model ZUX or equal.s
- 2.6 BOLTS, STUDS AND NUTS
- A. Steel Bolts, Studs, and Nuts: Comply with the current ASTM A307, Grade B, or equal.
- B. Provide galvanized or cadmium plated carbon steel bolts and nuts for flanged pipe joints.
- C. Bolt Heads and Nuts: Semi-finished, hexagonal, complying with the dimensions for the current American Standard for Square and Hex Bolts and Screws, ANSI B18.2.1.

- D. Threads: American National form right hand machine cut threads complying with the current American Standard for Unified Inch Screw Threads ANSI B1.1, Coarse Thread Series, Class 2 fit.

2.7 PIPE HANGERS AND SUPPORTS

- A. Hanger material shall be the same as the piping material. No exceptions.
- B. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inch: Adjustable wrought steel ring.
- C. Hangers for Pipe Sizes 2 Inches and Over: Adjustable wrought steel clevis.
- D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- E. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
- F. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
- G. Vertical Support: Appropriate for the upper attachment, example steel riser clamp or threaded rod hanger (equal to Sammys threaded rod hanger).
- H. Floor Support: Cast iron adjustable pipe saddle, locknut nipple, floor flange and concrete pier to steel support.
- I. Design hangers to impede disengagement by movement of supported pipe.
- J. Provide copper plated hangers and supports for copper piping or provide sheet lead packing between hanger or support and piping.
- K. Acceptable Manufactures: Anvil, B-Line, or approved equal.

2.8 PIPE SLEEVES

- A. For pipes that pass through the building, both below and above grade:
 - 1. Modular Mechanical Type Seal: Use LINKSEAL type pipe sleeves for the annular space between pipes and sleeves to seal against water or earth, consisting of interlocking synthetic rubber links compressed to positive seal by through bolts bearing on reinforced nylon polymer pressure plates. Provide 316 stainless steel bolts.
- B. For pipes passing between non-fire rated walls:
 - 1. Material: Seamless pipe, galvanized, ASTM A53 Large enough to accommodate the pipe and its covering, wall sleeves to be flush on both sides, and floor sleeves to be extended 1 inch above floor level. Where escutcheon plates are required, extend the sleeves 1/4 inch above the floor.

2.9 GATE VALVES

- A. Gate Valves, 2-1/2 Inches and Larger: Iron body, bronze mounted, non-rising stem, inside screws, double wedge or disc, screwed or flanged ends as indicated, 150 pound test, with hand wheel operators or as indicated, conforming with AWWA C-500. Valve rotation to open counter clockwise unless noted otherwise.

2.10 SWING CHECK VALVES

- A. Check Valves 2-1/2 Inches and Larger: Flanged with cast iron body, bronze mounted, iron disc, renewable seat rings, bolted cover, outside counterweights and lever, pressure rating of 150 psig and conforming to AWWA C-508, latest revision.

2.11 MISCELLANEOUS SMALL VALVES

- A. This article applies to all valves on plumbing and building service piping.
- B. Refer to valve schedules in Part 3 - Execution.

2.12 FLEXIBLE PIPE CONNECTIONS

- A. Steel Piping: Construct with stainless steel inner hose and braided exterior sleeve.
- B. Copper Piping: Construct with bronze inner hose and braided exterior sleeve.
- C. Use connectors suitable for minimum 125 psi and 450°F and 200 psi WOG and 250°F.
- D. Flexible Couplings for Ductile Iron Pipe for Air or Water Service: Rubber tube, neoprene cover, expansion, spool type joints.
- E. Manufacturers: Flexonics, Metraflex, and Twin City Hose, or approved equal.

PART 3 -EXECUTION

3.1 INSTALLATION

- A. Contractor shall provide survey to locate pipes, elevations, ducts, conduits, etc., and to prepare shop drawings. Variations to suit existing conditions, structural features or mechanical equipment shall be Contractor's responsibility.
- B. Run piping parallel with building lines and as direct as possible. Piping shall be concealed as far as possible in the finished portions of the building.
- C. Downfeed runouts for water piping shall be taken at 45 degrees or from bottom of main and upfeed runouts from the top of the main.
- D. Cut pipe accurately and install without springing or forcing. All burrs shall be removed after cutting.
- E. Install plumbing to applicable code requirements.
- F. Install shutoff valves on all branches serving two or more outlets close to the point where the branches leave the main.
- G. Install all supply piping for fixtures through the sidewalls unless otherwise noted on Drawings.
- H. Install shock absorbers on the water supply at flush valves or self-closing valves and at equipment with solenoid valves.
- I. Install above ground water piping so as to be completely drainable with stop and drain valves installed accessibly at the low points of the system.

- J. Lubricate cleanout plugs with mixture of graphite and linseed oil.
- K. Install shut-off valves for all fixtures and equipment.
- L. Sanitary lines sizes 3 inch and larger graded 1/8 inch per foot unless otherwise indicated. Sanitary lines smaller than 3 inch graded 1/4 inch per foot unless otherwise indicated.

3.2 PIPE AND FITTINGS

- A. Preparation: Ream pipes and tubes, clean off scale and dirt, inside and outside, before assembly. Remove welding slag or other foreign material from piping.
- B. Make screwed joints with full cut standard taper pipe threads with red lead and linseed oil or other approved non-toxic joint compound applied to male threads only.
- C. Provide neoprene gasketing system for cast iron bell and spigot pipe joints.
- D. Make steel pipe connections to equipment and branch mains with unions.
- E. Install pipe per manufacturer's instructions.
- F. Make connections to equipment and branch mains with unions.
- G. Provide non-conducting type (dielectric) connections wherever jointing dissimilar metals in open systems. Brass adapters and valves are acceptable.

3.3 PIPE HANGERS AND SUPPORTS

- A. Below are tables illustrating acceptable design hanger spacing. Follow applicable code requirements where more stringent.
- B. Support horizontal steel and copper piping as follows:

Nominal Pipe Size (in.)	Max Distance Between Support (ft.)
1/2 & 3/4	6
1 & 1-1/2	8
2 & 2-1/2	10
3 & 4	12
6 to 12	14

- C. Space Support for PVC pipe as follows:

Nominal Pipe Size (in.)	Max. Distance Between Support (ft.)
3/4 or less	4
1 & 1-1/2	5
2 & 2-1/2	6
3 & 4	7
6 & 8	9
10 & 12	10

- D. Install hangers to provide minimum 1/2 inch clear space between finished covering and adjacent work.
- E. Place a hanger within one foot of each horizontal elbow.
- F. Use hangers which are vertically adjustable 1-1/2 inch minimum after piping is erected.
- G. Support horizontal cast iron soil pipe near each joint, with 5 feet maximum spacing between hangers.
- H. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- I. Where practical, support riser piping independently of connected horizontal piping.
- J. Size hangers to fit around pipe, insulation and hanger shield.

3.4 FLASHING

- A. Flash and counterflash where mechanical equipment passes through weather or waterproofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting 12 inch minimum above finished roof surface with lead worked 1 inch minimum into hub, 8 inch minimum clear on sides with minimum 24 inch sheet size. For pipes through outside walls turn flange back into wall and caulk.
- C. Flash floor drains over finished areas with lead 10 inch clear on sides with minimum 36 inch x 36 inch sheet size. Fasten flashing to drain clamp device.

3.5 SLEEVES

- A. Set sleeves in position in advance of concrete work. Provide suitable reinforcing around sleeves. Core drilling is allowed up to 8" openings, with permission of Engineer.
- B. Install seals and provide floor plate.
- C. Size sleeves large enough to accommodate the pipe and covering. Wall sleeves to be flush on both sides and floor sleeves shall extend 1-inch above floor level. Where escutcheon plates are required, extend sleeves 1/4 inch above floor.
- D. Where piping passes through floor, ceiling or wall where no potential moisture exists, close off space between pipe and construction with non-combustible insulation. Provide tight fitting metal caps on both sides and caulk.
- E. Use modular mechanical type seal for the annular space between pipes and sleeves to seal against water or earth.
- F. Install chrome plated escutcheons where piping passes through finished surface.

3.6 VALVES

- A. General:
 - 1. Provide valves of same manufacturer throughout where possible.

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2. Provide valves with manufacturer's name and pressure rating clearly marked on outside of body.
 3. In potable water systems, provide valves where the wetted surfaces contain no more than 0.25% lead by weighted average "lead free" meeting NSF/ANSI Standard 61 or NSF/ANSI Standard 372.
- B. Installation:
1. Install valves with stems upright or horizontal, not inverted.
 2. Install ball valves for shut-off and isolating service, to isolate equipment, part of systems or vertical risers.
- C. Miscellaneous Valve Schedule:

Type	Size	Milwaukee Cat. #	Hmd. Cat. #	Crane Cat. #	Nibco Cat. #
Ball Valves	2" and smaller	UPBA450S	UP8311A		T-585-66-LF
Check Valves	2" and smaller. All bronze with sweat ends	1509T	IB945	1342	S-413-Y
	2" and smaller. All bronze with screwed ends	1510T	IB940	137	T-413-Y
Stop & Drain Valves					S-685-80-D

Type	Size	Milwaukee Cat. #	Nibco Cat. #
Butterfly Valves	2-1/2" and larger	CL223E	N200235

Type	Size	Mueller Cat. #	Kennedy Cat. #	Clow Cat. #
Gate Valves	2-1/2" and larger	2300 Series	F-5070	F-6102

3.7 TESTING

- A. General:
1. Each system of piping and control tubing tested by installer under superintendence of the Contractor.
 2. Provide pumps, gauges, instruments, test equipment personnel and clean auxiliary water. After tests have been made, remove all test equipment and drain all pipes.
 3. Submit a complete test report to the Engineer.
 4. Test prior to painting, installation and insulation, or concealment.
 5. Tests may be made on sections of piping as installed.
 6. Re-test repaired or revised piping.
- B. Pressure Systems:
1. Domestic hot and cold water.
 2. Test Pressure: 150 percent of the operating pressure.
 - a. Minimum Pressure: 50 psi.
 - b. Test Period: 2 hours minimum.

- C. Gravity Systems:
1. Waste drain, and vent systems, downspouts, rain leaders and their branches.
 2. Entire System: Close all openings except the highest and fill system with water to point of overflow.
 3. Sections: Close all openings except highest and provide a head of 10 feet. In testing successive sections, at least the upper 10 feet of next preceding section shall be included so every joint and pipe in the whole system (except the uppermost 10 feet) shall have been subjected to a head of 10 feet of water.
 4. After system or section under test has been filled with water, wait at least 15 minutes before starting inspection.
 5. After 2 hours (minimum) there shall be no evidence of leakage.
 6. Test waste, drain and vent pipe system before fixtures are installed and retest after fixtures have been installed.

3.8 CLEANING OF PIPING SYSTEMS

- A. Domestic Water: Flush with chlorine solution - AWWA C651 "Disinfecting Water Mains."

3.9 PIPE IDENTIFICATION

- A. Label all piping showing contents and direction of flow per ANSI/ASME A13.1.
- B. Verify label and text colors with Owner so as to match existing labeling scheme.
- C. Place label adjacent to each valve and branch takeoff, at each side of a wall or partition through which pipe passes; adjacent to all changes of direction and at 25 feet 0 inch spacing on straight runs.
- D. Labels shall be provided as follows:

Outside Pipe Diameter (Including Insulation)	Minimum Length of Label Color Field	Minimum Letter Height
0.75 - 1.25 inches	8 inches	0.5 inches
1.5 - 2 inches	8 inches	0.75 inches
2.5 - 6 inches	12 inches	1.25 inches

- E. Label Manufacturers: Seton Identification Products, Brady, Topflight Corporation, or equal.

3.10 VALVE IDENTIFICATION

- A. Brass Tags: 1 inch diameter, secured to each valve with brass S-hook and stamped with system designation and assigned number.
- B. Provide a printed schedule, in duplicate, describing each valve by number, giving location and service for which used.

3.11 EQUIPMENT IDENTIFICATION

- A. Provide equipment nameplates in a style, size and color to match existing Owner scheme. Provide at minimum a 2 x 4 inch engraved plastic laminate plate.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 SUMMARY

- A. This section includes the furnishing and installation of thermal insulation for plumbing piping as indicated on the drawings, as specified herein, and as required for the proper and complete performance of the work.
- B. Types of mechanical insulation specified in this section include the following:
 - 1. Piping Systems Insulation:
 - a. Fiberglass.

1.3 Related Sections: The following sections contain requirements that relate to this section:

- A. Section 22 00 00 - Plumbing General Provisions.
- B. Section 22 01 00 - Basic Materials and Methods - Plumbing.

1.4 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, k-value, thickness, r-factor, and furnished accessories for each mechanical system requiring insulation.

1.5 QUALITY ASSURANCE

- A. Installer's Qualifications: Firm with at least 5 years successful installation experience on projects with mechanical insulation's similar to that required for this project.
- B. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke developed index of 50 or less, as tested by ASTM E84 (NFPA 255) method and UL 723. Shipping containers for insulating materials shall bear the UL label.
 - 1. Exception: Outdoor mechanical insulation may have flame spread index of 75 and smoke developed index of 150.
 - 2. Exception: Industrial mechanical insulation that will not affect life safety egress of building may have flame spread index of 75 and smoke developed index of 150.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.
- B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

1.7 WARRANTY

- A. Warrant replacement insulation installation for one year from date of final acceptance at no additional cost to Owner.

PART 2 – PRODUCTS

2.1 PIPING INSULATION MATERIALS

- A. Subsequent references by name/model number to specific manufacturer's products are intended to indicate level of quality only.
- B. Fiberglass: Provide 1-piece preformed rigid molded fibrous glass, 4-lb density, with k-factor of 0.24 at 75°F complying with ASTM C547, rated for use to 850°F with factory-applied self-sealing lap vapor barrier jacketing complying with ASTM C921.
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. Knauf Fiberglass GmbH.
 - b. Manville.
 - c. Owens Corning Fiberglas Corporation, "SSL-II."
- C. Jackets for Field Application to Piping Insulation: Provide jacketing complying with ASTM C921; Type I (vapor barrier) for piping with temperatures below ambient, Type II (water vapor permeable) for piping with temperatures above ambient.
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville Zeston 2000 Series (20 mil thickness).
 - b. Proto.
 - 2. Encase pipe fittings insulation with 1-piece premolded PVC fitting covers, installed and adhered in accordance with manufacturer's recommendations.
- D. Insulation on Cold Fittings: Insulate fittings 3 inches and smaller with flexible fiberglass blanket compressed to the thickness of the adjacent insulation. Finish with a skim coat of approved insulating cement, glass fabric and approved vapor barrier mastic. For larger than 3 inches, insulate with flexible fiberglass blanket or mitered segments of fiberglass pipe insulation and finish as above.
- E. Piping Insulation Accessories: Provide staples, bands, wires, and cement as recommended by insulation manufacturer for applications indicated.
- F. Piping Insulation Compounds: Provide adhesives, sealers, and protective finishes as recommended by insulation manufacturer for applications indicated. Adhesives shall be waterproof.
 - 1. Adhesives:
 - a. Benjamin Foster.
 - b. Childers.
 - c. Marathon Corporation.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF PIPING INSULATION

- A. Install insulation products as specified herein; and in accordance with manufacturer's written instructions, and recognized industry practices to ensure that insulation serves its intended purpose.
- B. Install insulation on pipe systems subsequent to installation of heat tracing, painting, testing, and acceptance of tests.
- C. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.
- D. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- E. Provide exposed piping with a finish suitable for a final coat of paint. Concealed insulation will not be painted.
- F. Maintain integrity of vapor barrier jackets on pipe insulation and protect to prevent puncture or other damage. Stapling of vapor barrier jackets on cold piping will be permitted only if the staples are sealed with an approved vapor barrier mastic or vapor barrier tape. Maintain the vapor barrier seal throughout each system.
- G. Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.
- H. Extend piping insulation and vapor barrier without interruption through walls, floors and similar piping penetrations, except where otherwise indicated or prohibited by code. Coordinate with firestopping Installer for piping through-penetrations at fire rated barriers.
- I. Continue pipe covering for all insulated cold piping through all hangers and sleeves, with protective metal shield at each hanger, and with 12-inch section of covering material at each hanger of sufficient density to avoid crushing the insulation and damage to vapor barrier. As an option, provide wood blocking or dowel inserts at hangers in place of extra dense covering material.
- J. For hot pipes, apply 3-inch wide vapor barrier tape or band over the butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3-inch wide vapor barrier tape or band. Seal exposed ends of cold piping insulation with vapor barrier mastic.

- K. Wrap buried piping insulation with 2 layers of #15 felt wired with aluminum or copper clad bands on 16-inch centers. Seal longitudinal joints and laps with an approved asphaltic mastic.
- L. Trim covering neatly at hanger for all heated piping.
- M. Taper covering terminated at equipment, specialties, access doors, etc., or where jackets are pierced by metal parts such as hangers, thermometers, etc., and securely seal jacket to pipe or other metal parts.

3.3 PROTECTION AND REPLACEMENT

- A. Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.
- B. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- C. Remove and replace all insulating materials on which mold or mildew has occurred, or which have been discolored or stained due to mold, mildew or condensation within 1 year of substantial completion.

3.4 SCHEDULES

- A. General: Insulation thickness, unless otherwise specified, shall comply with ASHRAE Standard 90A.
- B. Piping:
 - 1. Plumbing Piping Items Not Insulated: Chrome-plated exposed piping (except for handicapped fixtures), air chambers, unions, strainers, check valves, balance cocks, flow regulators, drainage piping located in crawl spaces or tunnels, buried potable cold water piping, and pre-insulated equipment.
 - 2. Heated Piping Insulation Schedule: Minimum insulation thickness for the following pipe sizes.

Service	Pipe Sizes (inches)			
	1 & less	1 – 1-1/4	1-1/2 – 4	5 – 8
Domestic Hot Water	1	1	1.5	1.5

- 3. Cold Piping Insulation Schedule: Minimum insulation thickness for the following pipe sizes.

Service	Pipe Sizes (inches)			
	1 & less	1 – 1-1/4	1-1/2 – 4	5 & 6
Domestic Cold Water	1	1	1	1

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 GENERAL PROVISIONS

- A. General:
1. "Provide" means furnish and install.
 2. The provisions of this section shall apply to other work specified in Division 23 - Mechanical.
 3. Although the drawings attempt to depict ductwork, piping, and equipment as installed, actual conditions and locations of existing may differ from that shown. Field verify actual conditions prior to bid.
 4. Field mark and then verify all demolition work with Owner prior to commencing work.
 5. Submit equipment and product submittals to the Architect/Engineer for approval prior to construction.
 6. Upon completion of all work and tests, demonstrate to the Owner and Engineer that all systems are operating as intended.
 7. Train the Owner's personnel in the operation and maintenance of all equipment as required.

1.3 MECHANICAL WORK SCOPE SUMMARY

- A. General:
1. Furnish all materials, supplies, equipment, tools, transportation and facilities, and perform all labor and services necessary for the complete installation of the mechanical systems as shown on the drawings, as herein specified, and as required to make complete and operating systems.
- B. New Work:
1. Restroom Building:
 - a. The large Men's and Women's Restrooms are intended to operate seasonally only. There is no heat. A new exhaust system provides code required ventilation during programmed occupied hours. Make-up air enters via operable louvers provided by General Trades. Ceiling circulation fans contribute to occupant comfort.
 - b. The smaller restrooms, Storage Room and Concessions are intended to be available for occasional use year round. Electric heaters provide freeze protection and occupant comfort. Exhaust fans for the small restrooms are enabled by the lighting control and operate 10 minutes past sensed occupant movement.
 2. Provide roof mounted exhaust fan, ductwork system and exhaust grilles. The Electrical Contractor will connect the exhaust fans to time clock controller.
 3. Provide ceiling mounted exhaust fans, ductwork and brick vents at outside termination. Electrical Contractor will connect the exhaust fans to the light switch.
 4. Provide Electric Ceiling Heaters with factory mounted thermostats.

5. Provide Electric Unit Heaters with wall mounted thermostats. Electrical Contractor will connect the heaters to the wall mounted thermostats.
6. Commission all equipment as described in paragraph 3.11.

1.4 INTENT

- A. The intent of this division is to call for finished work, tested and ready for operation.
- B. Furnish all materials, supplies, equipment, tools, transportation and facilities, and perform all labor and services necessary for the complete installation of the mechanical systems as shown on the drawings, as herein specified, and as required to make complete and operating systems.
- C. The work shall also include the completion of such details of mechanical work not mentioned or specifically shown, but which are necessary for the successful operation of all mechanical systems.

1.5 CODES

- A. Where standards or codes are mentioned, the latest edition or revision in force shall be followed.
- B. Contract Documents shall take precedence when they are more stringent than codes, ordinances, standards, and statutes. Codes, ordinances, standards, and statutes shall take precedence when they are more stringent or conflict with the drawings and specifications.
- C. All mechanical work shall be installed as required per all relevant codes. If the Contractor believes the drawings and specifications are contrary to code, they shall stop work and notify the General Contractor and Engineer immediately.

1.6 PERMITS AND INSPECTIONS

- A. Secure and pay for all permits, inspections, tests and fees required for the work to be performed.
- B. Upon completion of the work, furnish inspection certificates as normally issued in connection with the work.

1.7 DRAWINGS AND SPECIFICATIONS

- A. Schedules shown on drawings are for convenience and not intended to be a count of equipment, fixtures, etc. Each supplier shall make a separate count of these items and shall be required to furnish the equipment, fixture and materials shown on the drawings but not included in the Schedule.
- B. Drawings show arrangement, general design and extent to the systems and are diagrammatic except where in certain cases they are detailed giving exact locations and arrangement.
- C. Drawings are not intended to be scaled for rough-in dimensions. Where shop drawings are required for this purpose or field measurements are needed for the installation, they shall be prepared by the installing contractor.

1.8 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Shop Drawings: Prior to delivery of any material to the job site, the Contractor shall submit shop drawings for review by the Engineer.
- C. Substitutions: See Part 2 of this section.
- D. Operating and Maintenance Instructions:
 - 1. Furnish sets of written Operation and Maintenance Data per specifications in Division 1.

1.9 RECORD DRAWINGS

- A. The Contractor shall be responsible to maintain a complete and accurate set of marked up drawings during construction per Division 1. Markups shall record any and all changes or deviations from the contract drawings.
- B. Record drawings shall be delivered to the Engineer after completion of the work as a permanent record of the installation as actually constructed.

1.10 CONTRACTOR RESPONSIBILITY

- A. Each Contractor all be responsible for the safety and good condition of all work and materials in the contract until its completion.
- B. Assume entire responsibility for all the materials, workmanship, and satisfactory performance of the systems installed. It is not intended to limit or restrict the Contractor to the use of materials and manner of shop fabrication or erection that is not in accord with best standard practice.
- C. It is also not intended that the drawings or this specification indicate or specify each item or material which is required to complete a satisfactory installation. Where such items are required and they are considered to be the accepted trade practice to provide same, they shall be considered to be both specified and indicated.
- D. The design and construction of all equipment and materials specified herein shall conform in all details with the latest revised codes of the American Society of Mechanical Engineers, the American Standards Association, American Society of Heating, Refrigeration, and Air Conditioning Engineers, and all existing laws, ordinances and requirements of the state.

1.11 DELIVERY, STORAGE AND HANDLING

- A. Protect all materials and equipment during delivery and during storage onsite. Store materials and equipment on suitable blocking to maintain parts clear of the ground and to insure drainage of all rainwater.

1.12 COORDINATION AND COOPERATION

- A. Submit to and obtain from trades concerned, copies of shop drawings and catalog data of work which connects with or affects their work.

- B. Make arrangements with other trades as required to properly correlate installation into the overall project.
- C. Each Contractor shall be responsible for establishing elevations and routing of ductwork and piping and to correlate the work with other trades.
- D. Coordinate location and arrangement of equipment, piping, ductwork, etc. In case of interferences between various items, or if simplified construction procedures are possible by relocation or changes in arrangement, change may be made if approved by the Engineer.

1.13 WARRANTY

- A. Warranty all labor, materials, and labor for a period of one (1) year from date of final acceptance.
- B. Alterations, repairs, or replacement of defects in materials, equipment, and labor shall be borne by the Contractor at the Contractor's expense.

1.14 MAINTENANCE AND SERVICE ACCESSIBILITY

- A. Install equipment, ductwork and piping to permit service and maintenance to all parts of the systems installed. Minor deviations from the drawings may be made to provide proper accessibility, but any major change will require written approval.

PART 2 -PRODUCTS

2.1 GENERAL

- A. Reference applicable technical sections in this division for specific systems.

2.2 MATERIALS, EQUIPMENT AND WORKMANSHIP

- A. All materials shall be new and shall be prepared, fabricated, and installed with skill and workmanship as is commonly considered to be the best in the trade involved. Work shall be performed at such times as will be best for the proper conduct of the entire project.
- B. The Engineer shall notify the Contractor of rejected or faulty work upon discovery, but this failure to detect omissions or violations of the Contract will not act as a waiver of the right to demand correction of defects in materials or workmanship.

2.3 SUBSTITUTION OF MATERIALS AND EQUIPMENT

- A. Certain materials and equipment are specified by manufacturer or trade name and catalog or model number to establish standards of quality, performance, design and suitability for intended use. The products of other manufacturers may be authorized by the Engineer if they are equal to those specified as determined by the Engineer and so approved in writing by the Engineer.
- B. If the Contractor provides equipment or materials listed in the specifications as "equal" or otherwise obtains written approval from the Engineer for a product substitution different from the listed design basis or specified equipment manufacturer and model number, it shall be the Contractor's responsibility to coordinate its installation with the work of all other

trades and with the space available. The Contractor shall also pay for any changes caused to other trades as a result of the substitution.

2.4 EQUIPMENT SUPPORTS

- A. Provide the supports and hangers for equipment installed under this work. Where equipment is to be suspended from the roof steel, provide intermediate support members such that the load is carried at the panel points of the joists or trusses.

2.5 COMPONENTS AND REVISIONS

- A. Components normally furnished with equipment shall be considered as part of the specification whether specifically mentioned or not. Any revision necessary due to substitution shall be the responsibility of the Contractor without extra cost to the project.

PART 3 -EXECUTION

3.1 EXAMINATION OF PREMISES

- A. Verify site conditions under which this work must be conducted prior to commencing. Contractor shall be held to have examined the premises and shall be satisfied and fully conversant with all conditions. No claim for additional compensation due to Contractor's failure to make this evaluation are allowed.
- B. Examine all spaces, surfaces, and areas to receive the work. Do not proceed until corrections, if any required, have been made.
- C. Verify dimensions, elevations, grades and obtain all measurements required for proper execution of the work.
- D. Verify points of connections to utilities prior to start of construction and report any inconsistency before commencing work.

3.2 INSTALLATION REQUIREMENTS

- A. Each subcontractor shall have in charge of work a competent, experienced superintendent who shall be qualified for the work to be performed.
- B. Coordinate and schedule the work with other trades to properly expedite the completion of the project. Consult with other trades so they are informed for coordination of all services.
- C. Equipment shall be set in place when necessary prior to enclosing the spaces. Any equipment that will not enter the normal openings provided or that will not fit into the designated areas will not be acceptable.
- D. Equipment shall be cleaned, aligned to tolerances specified by equipment manufacturer, and lubricated prior to start-up. Flush piping, valves, strainers, and similar devices. Adjust systems for proper operation.
- E. Perform system adjustments and place all equipment in operating condition. Obtain the services of approved factory trained technicians where specified in this Division to start the equipment in accordance with factory recommendations.

3.3 LUBRICATION

- A. Motors, fans or other equipment which depend upon lubrication shall be properly lubricated in accordance with manufacturer's instructions by Contractor.
- B. Lubrication shall be done prior to making any test runs or turning on any equipment.

3.4 CLEARANCES AND MAINTENANCE ACCESS

- A. Mechanical equipment shall be installed so maintenance and replacement can be performed without the removal of other equipment.
- B. Clearance around pumps, coils, fans, air conditioners, etc., shall be provided for operation, maintenance, replacement, repair, and removal.
- C. Piping connections to equipment shall be made with valves, unions, or flange fittings to permit their repair or removal without causing damage to piping or equipment.
- D. Install all ducts, piping, conduit, wiring, switches, panels, fixtures, etc., to accommodate any obstacles anticipated or encountered during construction. Determine exact route and location of ductwork, piping, or raceway prior to fabrication.
- E. Prior to shop fabrication of ductwork, piping, conduit, etc., make field measurements and make shop drawings to check for clearances and interferences.
- F. Due to the scale of drawings, all required fittings, offsets, elevation changes, and routing are not shown. The intent of these drawings and specifications is that these shall be installed without additional cost.
- G. Maintain proper headroom.

3.5 OPENINGS

- A. Provide openings in walls, ceilings, floors, or roofing that are part of the existing construction as required for the installation of the work.
- B. The location and size of all openings shall be the responsibility of each subcontractor for the trade involved.
- C. Install and provide sleeves, inserts, panels, raceways, boxes, curbs, etc., ahead of the work to be performed.
- D. Openings shall be neatly patched after installation of the work.
- E. Flash and counterflash where mechanical equipment passes through waterproofed walls, floors, and roofs.

3.6 CUTTING AND PATCHING

- A. Cutting shall be avoided whenever possible, but any cutting required in the new construction shall be performed by the Contractor under the direction of the General Contractor.

- B. Where piping, ductwork, conduit, etc., must pass through walls, floors, or other building components, the Contractor shall provide reinforcement or support adjacent to the opening to compensate for the removal of any support material.

3.7 GENERAL CLEANING

- A. Upon completion of the work, leave all surfaces broom clean and vacuum all ductwork, piping, conduit external surfaces.
- B. The entire installation shall be thoroughly free from oil and grease, dust and dirt, and any other foreign matter.
- C. Special cleaning methods shall be described in individual sections of this specification.

3.8 REMOVAL OF RUBBISH

- A. Remove on a daily basis all rubbish, debris, dirt, cartons, materials, etc. resulting from the work. Remove during construction to keep dirt accumulation to a minimum.

3.9 PROTECTION

- A. Protect all work from damage and protect the Owner's property from injury or loss during the performance of the work.
- B. Properly protect adjacent property as provided by law and the contract documents. Provide and maintain all passageways, guard fences, lights, and other facilities for protections required by local conditions.
- C. Any damage shall be repaired to original condition and acceptable to the Owner.

3.10 LEAK DAMAGE

- A. Damage caused by leaks in any of the equipment or piping installed by the Contractor to the building or to the work of other Contractors or to the contents, etc., shall be repaired by the Contractor who caused such damage at the Contractor's expense.

3.11 STARTUP AND COMMISSIONING

- A. The Contractor shall properly commission all mechanical systems.
- B. All Contractors shall work with and under the direction of the Engineer, Owner and Construction Manager / General Contractor to fully commission all systems as specified herein and in the technical specification sections. Commissioning activities include, but are not limited to performing startup and check, verification that equipment is adjusted to meet the space requirements, programming thermostats based on the owner's input, and owner training.
- C. The mechanical contractor shall verify all sensors and actuators, etc., are properly wired, calibrated, and functioning.
- D. The mechanical contractor shall perform a step-by-step process whereby each required control sequence, safety, operational parameter, etc., is verified and documented.

3.12 OWNER TRAINING

- A. After all HVAC systems have been successfully started and tested the mechanical contractor shall provide Owner training to the Owner's maintenance staff.

3.13 PROJECT CLOSEOUT DOCUMENTS

- A. Provide closeout documents as described in this section and Division 1.

PART 4 - METHOD OF MEASUREMENT

4.1 GENERAL

- A. The work associated with mechanical shall be incidental to Specification 331500.01 and will not be measured separately for payment. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment, the Engineer/Architect shall observe site conditions with the owner for approval.

PART 5 - BASIS OF PAYMENT

5.1 PAYMENT

- A. Mechanical within building footprint shall be included as part of Pay Item 331500.01 Restroom Building.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

- A. This Section specifies the requirements and procedures for total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of mechanical systems fluid flow rates as required to meet design specifications and recording and reporting the results of these measurements.
- B. Systems testing, adjusting, and balancing (T/A/B) consists of checking and adjusting all building environmental systems to produce design objectives. It includes, but is not necessarily limited to, the following:
 - 1. Balancing of air distribution.
 - 2. Adjustment of total system to provide design flow rates.
 - 3. Electrical measurements.
 - 4. Assistance with the verification of performance of all equipment and automatic controls.
- C. For **exhaust fans**, perform test and balance activities for the following:
 - 1. Test and record all associated electrical motor data and mechanical fan data including fan size and type, motor model and type, motor HP, voltage, service factor, max amps, actual amps, calculated brake HP, motor RPM, fan RPM, all pulley and belt information, etc.
 - 2. Test and balance all exhaust air duct systems (including all air inlets and outlets) and cfm measurements to verify / confirm specified design flows.
- D. Provide test and balance services for the following systems.
 - 1. Exhaust Fans
 - a. EF-1
 - b. EF-2
 - c. EF-3

1.2 RELATED SECTIONS

- A. Section 23 00 00 - HVAC General Requirements
- B. Section 23 01 00 - Basic Materials and Methods - HVAC
- C. Section 23 30 00 - Ductwork and Ductwork Accessories
- D. Section 23 34 00 - Fans and Power Ventilators
- E. Section 23 37 00 - Air Inlets and Outlets

1.3 SYSTEM PERFORMANCE REQUIREMENTS AND OBSERVED FIELD PROBLEMS

- A. Required systems performance: Balance all systems to within 8% of the stated performance values.
- B. System Balancing Problems: If it becomes apparent that the various systems cannot be balanced to within 8% of the stated performance values due to some system installation or equipment performance problem, stop work as soon as possible and immediately contact the Architect / Engineer. DO NOT proceed with system balancing and submit a complete report if there are system design or performance problems.

1.4 DEFINITIONS:

- A. Test: To determine quantitative performance of equipment.

- B. Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment (e.g., reduce fan speed, throttling).
- C. Balance: To proportion flows within the distribution system (submains, branches, and terminals) according to specified design quantities.
- D. Procedure: Standardized approach and execution of sequence of work operations to yield reproducible results.
- E. Report Forms: Test data sheets arranged for collecting test data in logical order for submission and review. This data should also form the permanent record to be used as the basis for required future testing, adjusting, and balancing.
- F. Terminal: The point where the controlled fluid enters or leaves the distribution system. These are supply inlets on water terminals, supply outlets on air terminals, return outlets on water terminals, and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.
- G. Main: Duct or pipe containing the system's major or entire fluid flow.
- H. Submain: Duct or pipe containing part of the system's capacity and serving two or more branch mains.
- I. Branch Main: Duct or pipe serving two or more terminals.
- J. Branch: Duct or pipe serving single terminal.

1.5 SUBMITTALS:

- A. Submit under provisions of Division 1 - Submittal Procedures.
- B. Sample Forms: Submit sample forms, if other than those standard forms prepared by the AABC are proposed.
- C. Certified Reports: Submit T/A/B reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are true representation of how the systems are operating at the completion of the T/A/B procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below:
 - 1. Draft Reports: Upon completion of T/A/B procedures, prepare draft reports on the approved forms. Draft reports may be handwritten but must be complete, factual, accurate, legible, and include flow coefficients and final static and pressure setpoints. Organize and format draft reports in the same manner specified for the final reports. Submit two complete sets of draft reports. Only one complete set of draft reports will be returned.
 - 2. Final Report: Upon verification and approval of draft reports, prepare final reports, type written, and organized and formatted as specified below. Submit two complete sets of final reports.
 - 3. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl 3-ring binders. Provide binding edge labels with the project identification and title descriptive of the contents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
 - a. General Information and Summary.
 - b. Air Systems.
 - 4. Report Contents: Provide the following minimum information, forms and data:

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TESTING, ADJUSTING AND BALANCING

- a. General Information and Summary: Inside cover sheet to identify T/A/B agency, Contractor, Owner, Engineer, and Project. Include addresses, and contact names and telephone numbers. Also include certification sheet containing the seal and name address, telephone number, and signature of the Certified Test and Balance Engineer. Include in this division a list of instrumentation used for the procedures along with the proof of calibration.
 - b. Remainder of Report: Include appropriate forms containing as minimum, the information indicated on the standard report forms prepared by the AABC, for each respective item and system. Prepare schematic diagram for each item of equipment and system to accompany each respective report form.
- D. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within period of 6 months prior to starting the project.
- 1.6 QUALITY ASSURANCE:
- A. Codes and Standards: Perform T/A/B work in accordance with applicable provisions of the following:
 - 1. AABC: National Standards for Total System Balance, 7th Edition.
 - 2. ASHRAE: ASHRAE Handbook, 2019 Applications Volume, Chapter 39, Testing, Adjusting, and Balancing.
 - 3. ASHRAE: ASHRAE Standard 111-2008 (RA 2017) Testing, Adjusting, and Balancing of Building HVAC Systems (ANSI approved).
- 1.7 PROJECT CONDITIONS:
- A. Systems Operation: Systems shall be fully operational prior to beginning procedures.
 - B. Pre-Balancing Checklist: Prior to beginning T/A/B procedures, survey all systems scheduled to be tested, adjusted, and balanced. Identify all incomplete work, non-functioning systems or missing devices which will prevent effective performance of T/A/B work. Present this information to appropriate mechanical systems installers in checklist form. Do not begin T/A/B work until all checklist items have been satisfactorily addressed.
- 1.8 SEQUENCING AND SCHEDULING:
- A. Develop and then coordinate and verify the Proposed TAB schedule with the Construction Manager / General Contractor and Engineer / Owner prior to proceeding.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING:

- A. Before operating the system, perform these steps:
 - 1. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.
 - 2. Obtain copies of approved shop drawings of all fans and outlets (supply and exhaust).
 - 3. Compare design to installed equipment and field installations.
 - 4. Check dampers for correct and locked position before starting fans.
 - 5. Prepare report test sheets for both fans and outlets.

6. Determine best locations in main and branch ductwork for most accurate duct traverses.
7. Place outlet dampers in the full open position.
8. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.
9. Lubricate all motors and bearings.
10. Check fan rotation.

3.3 MEASUREMENTS:

- A. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.
- B. Provide instruments meeting the specifications of the referenced standards. Use only those instruments with the maximum field measuring accuracy and are best suited to the function being measured.
- C. Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.
- D. When averaging values, take sufficient quantity of readings which will result in repeatability error of less than 5 percent. When measuring single point, repeat readings until 2 consecutive identical values are obtained.
- E. Take all reading with the eye at the level of the indicated value to prevent parallax.

3.4 PERFORMING TESTING, ADJUSTING, AND BALANCING:

- A. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.
- B. Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.
- C. Patch insulation, ductwork, and housings, using materials identical to those removed.
- D. Seal ducts and piping, and test for and repair leaks.
- E. Seal insulation to reestablish integrity of the vapor barrier.
- F. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
- G. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

3.5 RECORD AND REPORT DATA:

- A. Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by the referenced standards, and as approved on the sample report forms.
- B. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.
- C. Reports shall include final static pressure setpoints for tested exhaust fans.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 SECTION INCLUDES

- A. Work of this section includes ductwork and ductwork accessories.
 - 1. Exhaust Grilles
 - 2. Galvanized steel ductwork
 - 3. Duct sealants
 - 4. Miscellaneous ductwork accessories.

1.3 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Submit product data for the following:
 - 1. Exhaust grilles
 - 2. Duct application schedule showing intended use including location and system, material, pressure class, sealing class, gauge, coatings, and joining methods.
 - 3. Duct sealant
 - 4. Typical branch takeoffs from mains
 - 5. Duct fittings
 - 6. Duct hangers and supports

PART 2 - PRODUCTS

2.1 EXHAUST GRILLES

- A. See Schedules on drawings.
- B. Allowable manufacturers:
 - 1. Titus
 - 2. Kees
 - 3. Krueger
 - 4. Price
 - 5. Tuttle & Bailey
 - 6. Other manufacturers as determined equal by the Engineer prior to bid. See Section 23 0 00 - HVAC General Provisions for additional requirements for substitutions

2.2 METAL DUCTWORK AND FITTINGS

- A. Metal ductwork shall be constructed of galvanized steel or aluminum and supported and braced as specified in paragraph 2.3. Construct all ductwork as shown in the SMACNA duct manual.
- B. Seal all transverse joints, longitudinal seams, and duct penetrations per SMACNA Seal Class A.

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DUCTWORK AND DUCTWORK ACCESSORIES

- C. Joint and seams for rectangular ducts, elbows, tees and transformations are at least one gauge heavier than the duct material and all laps to be in the direction of air flow. No sheet metal screws used in the joining or fabrication of ducts when it is possible to use rivets and bolts. All edges and slips finished smooth inside the ducts. Joints and seams airtight.
- D. Elbows and tees constructed with a centerline radius of at least one and a half times the duct diameter or equivalent duct dimensions in case of rectangular ducts, with single thickness turning blades unless shown otherwise on the drawings. The inlet stream edges of the blades shall be properly stiffened, installed straight and securely fastened by riveting to the inside of ducts.
- E. All branch takeoffs shall be conical or 45 degree entrance type.
- F. All ducts shall be braced and stiffened so as not to breathe, rattle, vibrate or sag. The bracing applied to the outside of all ducts same as shown in said schedule, and may consist of standing seams, modified angles, and cross breaking supplemented by angle stiffener. All ducts shall be adequately supported at not greater than 5 foot intervals.
- G. Flex duct shall not be permitted.
- H. Fibrous glass ductwork shall not be permitted.

2.3 DUCT HANGERS AND SUPPORTS

- A. All ducts shall be supported by 1/4 inch threaded rods and either angle type trapeze brackets or, for round ductwork, round saddle band.
- B. Interior hanger spacing shall not exceed 8 feet. Interior hanger rods shall be constructed of hot-dipped galvanized steel for galvanized steel duct and of stainless steel otherwise. Comply with SMACNA's "HVAC Duct Construction Standards" for duct hangers' minimum size and spacing.
- C. Galvanized rope hanger systems are acceptable provided the duct shape is retained and point of contact with the duct are not overstressed. Use stress distribution saddles as necessary.
 - 1. Acceptable manufacturers: Gripple Hang-Fast Stranded Galvanized Rope System with cable lock hangers, DuroDyne Dyna-Tite galvanized wire rope system with cable lock hangers.

2.4 DUCTWORK FABRICATION SCHEDULE

- A. The Table below provides a schedule of required duct systems.

DUCTWORK FABRICATION SCHEDULE			
SERVICE	MATERIAL	PRESSURE	SEAL CLASS
General Exhaust Duct	GS	+2	A

2.5 DUCT SEALANTS

- A. Refer to SMACNA HVAC Duct Construction Standards, paragraph S1.9.

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DUCTWORK AND DUCTWORK ACCESSORIES

- B. Sealant: Elastomeric compound, gun or brush grade, maximum 25 flame spread and 50 smoke developed (dry state) compounded specifically for sealing ductwork as recommended by the manufacturer. Generally provide liquid sealant, with or without compatible tape, for low clearance slip joints and heavy, permanently elastic, mastic type where clearances are larger. Oil base caulking and glazing compounds are not acceptable because they do not retain elasticity and bond.
- C. Tape: Use only tape specifically designated by the sealant manufacturer and apply only over wet sealant. Pressure sensitive tape shall not be used on bare metal or on dry sealant.
- D. Gaskets in Flanged Joints: Soft neoprene.

PART 3 - INSTALLATION

3.1 INSTALLATION

- A. Install all items in accordance with manufacturer's instructions.
- B. Install in first class and workmanlike manner, true to the dimensions indicated on the drawings, straight and smooth on the inside and with airtight joints.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 SECTION INCLUDES

- A. Fans and Power Ventilators and Accessories.

1.3 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product data for specified equipment including
 - 1. Fan model numbers, cut sheets, performance data, motor data, dimensional data, accessories, etc.

PART 2 - PRODUCTS

2.1 EXHAUST FANS

- A. As scheduled on the drawings.
- B. Provide all required accessories and components as scheduled on the drawings and otherwise as required for a complete working system.
- C. Manufacturers: Broan, Loren Cook, Greenheck, or equivalent as approved by the Engineer and Owner. See Section 23 00 00 - HVAC General Provisions regarding product substitutions.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. In accordance with manufacturer's instructions.
- B. Provide all necessary incidental equipment, wiring and materials for complete installation. Allow adequate clearance around equipment, piping and fittings for maintenance and operation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 SECTION INCLUDES

- A. Electric fan forced heaters.

1.3 SUBMITTALS

- A. Submit under provision of Division 1.
- B. Product data for the following:
 - 1. Electric heaters
- C. Provide wiring diagrams.
- D. Operation manual containing installation operation and maintenance instructions, wiring diagrams, and spare parts list furnished as specified in Division 1.

PART 2 - PRODUCTS

2.1 ELECTRIC HEATERS

- A. As scheduled on the drawings.
- B. Provide all required accessories as scheduled on the drawings and otherwise as required for a complete working system.
- C. Acceptable Manufacturers: Raywall, Qmark, TPI/Markel, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. In accordance with manufacturer's instructions.
- B. Provide all necessary incidental equipment, wiring and materials for complete installation.
- C. Allow adequate clearance around equipment, piping and fittings for maintenance and operation.
- D. Provide clearances for thermal distribution and airflow as required by manufacturers.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 SECTION INCLUDES

- A. General provisions for electrical work for the Tierney Park Upland Planning project in Lexington, Michigan.
- B. Coordinate construction activities, demolition, and installation for electrical related systems with other trades. Refer to Division 1 Specification for the general project phasing that may be required for this project.

1.3 GENERAL PROVISIONS

- A. General:
 - 1. "Provide" means furnish and install.
 - 2. The provisions of this section shall apply to other work specified in Division 26 - Electrical.
 - 3. Submit equipment and product submittals to Engineer for approval prior to construction.
 - 4. Commission all electrical systems as specified and required.
 - 5. Provide Operation and Maintenance Manuals.
 - 6. Train the Owner's personnel in the operation and maintenance of all equipment as required.

1.4 SUMMARY OF WORK

- A. General:
 - 1. Prior to performing the work, the Contractor shall familiarize himself with the site and be aware of limitations to consider when accessing the work location with construction equipment.
 - 2. Obtain permits required by the municipality and other local jurisdictions for work performed by this contract.
 - 3. Coordinate layout and installation of all work for this contract with other Contractors on site and through the Engineer.
 - 4. Furnish and install all support devices including miscellaneous steel, hangers, brackets, clamps, anchors, etc., as required to adequately install, support, and maintain all conduit, cable tray, cables, lighting, distribution equipment, devices, and fixtures installed by this contract.
 - 5. Layout, coordinate, furnish and install all sleeves, flashing, and patching as required for all wall, roof, floor, grating, etc., penetrations for all work by this contract.
 - 6. Field touch-up paint to existing condition, all equipment damaged or installed by work by this contract in accordance with Owner's painting standards and the technical specifications.
 - 7. Coordinate deliveries, receipt, handling, off-loading, storage and security for all Contractor furnished materials. Owner or Engineer will not be responsible for lost or stolen materials furnished by Contractor and will not assume responsibility for

materials until satisfactory installation. Coordinate on site storage of all Contractor furnished materials and equipment with the Engineer.

8. Receive, inspect, off load, store, stage, and protect all equipment, devices, and materials furnished by the Owner for this contract.
9. "Commission" or energize all equipment and systems installed by this contract including coordination with Engineer and other contractors.
10. Provide start-up assistance for systems furnished under this contract.
11. Maintain on site a detailed as-built record set of all work installed by this contract as applicable. Final set to be submitted to Engineer upon completion of work.
12. Receive, inspect, off load, store, stage, and protect all equipment, devices, and materials furnished by the Owner for this contract.
13. Furnish and install all equipment grounding.
14. "Commission" or energize all equipment and systems installed by this contract including coordination with Engineer and other contractors.

B. New Construction Requirements:

1. Coordinate service entrance and meter socket requirements and connection with local electric utility.
2. Provide electrical distribution equipment as shown on the drawings. Provide all panels, disconnects, terminations, conduit, and wiring as shown on the drawings and as required for a complete operable system.
3. Provide surge protective device (SPD) for main distribution panel.
4. Provide interior and exterior LED lighting throughout building as shown on the plans. Provide all light fixtures, drivers, battery packs, power packs, occupancy sensors, switches, contactors, time clocks, conduit, cable, wire, etc., as required for a complete and operable system.
5. Provide receptacles for general power as shown on drawings. Provide conduit and wire as required.
6. Provide power to all mechanical equipment. Provide disconnects, motor starters, control power transformers, conduit, and conductors as required. Mechanical equipment includes, but may not be limited to, the following:
 - a. Exhaust fans
 - b. A/C units
 - c. Water heater(s)
 - d. Electric heater(s)
 - e. Solenoid valve(s)
7. Provide ceiling fans, wall controllers, and associated conduit and conductors.
8. Provide power to hand dryers.

C. Site Restoration Requirements: (where not covered by another spec section)

1. General: All areas disturbed by construction operations shall be restored to the original condition. All improved surfaces disturbed by construction operations shall be replaced to uniform lines and grades.
2. Aggregate surfaces: Shall be replaced at a thickness equal to the thickness of the existing, adjacent to the disturbed area, but not less than one and one-half (1-1/2) inches thick. The edges of the existing aggregate surface shall be trimmed and shall be free of all foreign material before the new aggregate is placed. The subgrade shall be graded and compacted to the proper lines and grades to match the adjacent surface.
3. Concrete surfaces: Shall be replaced where removed during the installation of the utility or broken by the Contractor. The thickness of the concrete shall be the same as is the concrete adjacent to the disturbed but shall not be less than four (4) inches. The alignment and grade and the contour and finish of the surface shall be the same as the adjacent concrete.

4. Subgrade Soil: Excavated areas below the finished grades shall be filled with sand. Filling must be deposited in horizontal layers and compacted sufficiently to prevent settlement. Machine compaction shall be used. Backfill shall be clean, free from rock, debris, frozen materials, etc. Backfill shall be placed in 6-inch layers and compacted. The Contractor shall hand rake the area in the vicinity of excavations restoring 4 inches from original grade. Final grade as described below.
5. Turf: All areas of established turf shall be replaced as nearly as possible to their original condition. Topsoil shall be placed at a minimum depth of four (4) inches over all areas disturbed by the Contractor's operations. All previously seeded lawn areas shall be reseeded with Class A seed. Other areas disturbed by the Contractor's operations shall be seeded with Roadside seed.

1.5 STANDARDS

- A. Applicable Standards and Codes:
 1. Institute of Electrical and Electronic Engineers (IEEE).
 2. Underwriters Laboratories, Inc. (UL).
 3. National Electrical Manufacturers Association (NEMA).
 4. National Electrical Code (NEC).
 5. American Society for Testing and Materials (ASTM).
 6. American National Standards Institute (ANSI).
 7. National Board of Fire Underwriters (NBFU).
 8. National Fire Protection Association (NFPA).
 9. National Electrical Contractors "Standard of Installation" (NECA)
 10. Joint Industrial Council (JIC).
 11. Code of Federal Regulations (CFR). Title 29 Labor, Subpart S-Electrical.
- B. Where quantities, sizes, or other requirements shown on the drawings or specified herein exceed the requirements of the above standards and codes, the drawings and specifications shall govern.

1.6 SUBMITTALS

- A. Submit under provision of Division 1.
- B. Submit materials and equipment for review to Engineer as required in each section. Each sheet of descriptive literature submitted shall be clearly marked to identify the material or equipment and shall show the specification paragraph for which the equipment applies.
 1. Submit schematics and connection diagrams for all electrical equipment. A manufacturer's standard connection diagram or schematic showing more than one scheme of connection will not be accepted unless it is clearly marked to show the intended connections.
 2. Submittals showing more than the particular item under consideration shall have the pertinent description paragraph for which the equipment applies circled or highlighted with a marker intended for that purpose.
- C. Prepare and maintain record drawings current with work completed. Show all changes to underground and other hidden work. Submit to Engineer on completion of project.
- D. Operating and Maintenance Instructions:
 1. Upon completion of all work and tests, instruct the Owner in the operation and maintenance of all components.
 2. Furnish sets of written Operation and Maintenance Manuals per Division 1 - Submittals.

1.7 CLEARANCES

- A. Equipment:
 - 1. Maintain clearances from electric panels, and other electrical installations as required by NEC and CFR.
 - 2. Maintain working clearances around electrical equipment as required for proper maintenance and operation.

1.8 IDENTIFICATIONS

- A. Provide identification signs/nameplates on all equipment, switches, breakers, panels and electrical related enclosures.
- B. Provide a typewritten circuit identification schedule in each distribution or branch circuit panelboard under glass or plastic. Each circuit to be identified by load.

1.9 CODES AND STANDARDS

- A. These specifications are minimum requirements and shall govern except where made more stringent by other sections of this specification or local, state, or federal laws or regulations. In the event of conflict between these specifications and applicable codes and regulations, the codes and regulations shall govern.

1.10 PERMITS AND INSPECTIONS

- A. Obtain all necessary permits and pay all fees in connection with all permits, inspections, and approval by the proper authorities in local jurisdiction of such work. Final inspection by the Owner will not occur until necessary certificates of satisfactory inspection are received. Utility company installation and premium charges in all forms are to be paid by the Owner. Excess allowance amounts shall be credited and inadequate allowance amounts shall be charged to Owner.

1.11 ALLOWANCES

- A. Electrical Service: Contractor to include a \$15,000.00 allowance within his base bid to pay for new electrical distribution system. Temporary construction power, in and out charges and temporary power KWHr consumed during construction are not part of this allowance. Only the paid invoices from Electrical Utility Company for permanent service are to be deducted from the allowance. A Change Order will be written adjusting the base contract +/- upon submission (marked paid). Contact DTE Power Company to coordinate all service related work.
- B. Internet Service: Contractor to include a \$4,000.00 allowance within his base bid to pay for internet service. Only the paid invoices from service provider for the work are to be deducted from the allowance. A change order will be written adjusting the base contract +/- upon submission (marked paid) of the internet service provider's invoices. Contact the internet provider to coordinate work.

1.12 DRAWINGS

- A. Drawings and Specifications are provided for assistance to the Contractor and are diagrammatic only to indicate the general arrangement and location of circuits, outlets, etc. Exact locations will be determined by field conditions. Deviations from the arrangement

indicated to meet actual conditions shall be made with no expense to the Owner. Throughout the progress of construction, the Contractor shall keep a set of detailed field record drawings, including the exact location of concealed work and underground utilities. This requirement does not authorize any deviations from the contract drawings without prior approval from the Owner. The field record information shall be marked in a legible manner on prints of the drawings. At the completion of work, the Contractor shall deliver the field record information to the Owner.

1.13 DELIVERY, STORAGE AND HANDLING

- A. All equipment shall be stored and protected from dampness and humidity during construction.

1.14 MAINTENANCE

- A. Touch up or refinish damaged paint.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All electrical equipment and material shall be furnished new and shall be accepted, or certified, or listed or labeled or otherwise determined to be safe by a nationally recognized testing laboratory (NRTL) by meeting the requirements below:
 - 1. Equipment shall be accepted, certified listed, and labeled by UL and Factory Mutual Insurance Company (FM).
 - 2. Equipment or material accepted certified, listed or labeled by an accepted NRTL shall be used in preference to equipment or material that does not have that acceptance. Where equipment meeting the above, is not available:
 - a. Equipment or material inspected or tested by a federal agency, the State of Michigan, or by the municipality having jurisdictional responsibility for enforcing occupational safety provisions of the NEC and found in compliance with the provisions of the NEC as applied in paragraph 1910.309 of Department of Labor General Industry Safety Standards Commission Bulletin.
 - b. Custom manufactured or installed equipment shall use components accepted, certified, listed or labeled by a NRTL and manufactured shall submit data indicating such acceptance, certification listing or labeling to the Engineer.
- B. Substitutions for materials and equipment listed herein must be of equal standards, quality and desired operation, or superior. There will be no approval or consideration for approval of equipment or material submittals for substitution prior to award of the contract. Requests for substitutions/alternate equipment must be received by the Engineer not later than 24 hours after the bids are received.
- C. All packaged equipment shall be completely factory wired prior to delivery to the jobsite. Connection to and bonding of this equipment is required under this section of the specifications.
 - 1. Check all prewired controls before energizing to verify that all internal wiring is properly coordinated to the voltage to be applied.

2.2 SHOP/FACTORY/FINISHING

- A. Provide baked enamel finishes on exposed surfaces.
- B. Provide galvanized finishes for damp or wet locations.
- C. Touch up or refinish damaged paint.

PART 3 - EXECUTION

4.1 INSTALLATION

- A. Provide and install all equipment as specified, required or implied in this specification except as noted. This requirement shall include all labor, materials, and incidentals in a manner consistent with good practice necessary to a complete operable installation.
- B. The Contractor shall implement cooperation with other trades by his reference to the structural and mechanical drawings and specifications for work by other trades and to be carried on simultaneously or sequentially with the electrical work. This requirement is to facilitate construction to proceed with no harm to the Owner due to the absence of cooperation. All other drawings and specifications shall become part of the electrical specifications as they relate to electrical work.
- C. Verify equipment dimensions to insure dimensional compatibility. Dimensions of equipment contained in shop drawing submittals are to be verified, for proper fit within space allowed for all equipment, prior to shop drawing submittal. Coordinate dimensions of equipment with equipment provided by other trades. Modify or replace equipment that is found to not fit properly, at no additional cost to the Owner/project.
- D. All excavation, backfilling, and concrete work shall conform to the applicable sections of these specifications.
- E. The Contractor is responsible for connecting wiring and circuitry to all equipment furnished by others and the Contractor that requires electrical power or control.

4.2 TEST AND OPERATION

- A. Equipment:
 - 1. Thoroughly clean, lubricate, and protect from damage and dirt during operation.
 - 2. Test and operate in accordance with manufacturer's recommendations.

4.3 START-UP

- A. Contractor to provide personnel for one day, a minimum of 8 hours for the following:
 - 1. The Contractor shall demonstrate to the satisfaction of the Owner at final inspection that the wiring is complete and free from open circuits, short circuits between circuits or ground and that systems operate satisfactorily. The entire electrical installation shall be demonstrated to operate in accordance with the specifications
 - 2. The Contractor shall demonstrate to the satisfaction of the Owner at final inspection that the lighting control system operates satisfactorily. The entire electrical installation shall be demonstrated to operate in accordance with the specifications.

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3. The Contractor shall perform operational start up, system check out and debugging of the system installation with Engineer and Owner's Representative.
- B. Contractor shall provide written notice to the Engineer 48 hours in advance of intended start-up visit.

PART 4 - METHOD OF MEASUREMENT

4.1 GENERAL

- A. The work associated with electrical shall be incidental to Specification 331500.01 and 331600.01 and will not be measured separately for payment. The Contractor must be responsible for the various tasks noted in this section and as shown on the plans.
- B. Prior to acceptance and final payment, the Engineer/Architect shall observe site conditions with the owner for approval.

PART 5 - BASIS OF PAYMENT

5.1 PAYMENT

- A. Electrical within building footprints shall be included as part of Pay Items 331500.01 or 331600.01 Restroom Building and Pavilion Building respectively.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 DESCRIPTION

- A. Work of this section includes wire and cable for all types of applications 600V and below.
- B. All conductors required for a fully functioning system shall be provided.
- C. All conductors shall be sized per NFPA 70 as a minimum, even if indicated otherwise.
- D. All conductors shall be installed in approved raceway.

1.3 RELATED SECTIONS

- A. Section 26 27 26 - Wiring Devices.

1.4 SUBMITTALS

- A. Submit under provision of Division 1.
- B. Provide voltage and insulation test data from the cable manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Cable shall be on original reels or in boxes and shall be new and unused.
- B. Store cables in dry protected area and protect cable ends in accordance with manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 LOW VOLTAGE, LIGHTING AND POWER CONDUCTORS

- A. Conductors provided on 120/208 and 277/480 volt power and lighting systems to be ASTM B-8 soft drawn copper. No. 8 AWG and larger, stranded; No. 10 AWG and smaller, solid.
- B. Insulation system shall be type THHN or THWN-2 rated 600V as defined and listed in Article 310 of NEC.
- C. Minimum size conductor utilized shall be #14 AWG for control circuits and #12 AWG for power and lighting circuits.
- D. Color code conductor insulation as follows: (Color shall be integral with the insulation compound applied by cable manufacturer.)
 - 1. Line Voltage - Black
 - 2. Grounding Conductor - Green
 - 3. Neutral - White

- 4. Control - Red
- 5. DC Circuits - Blue
- 6. Voltage from External Source - Yellow

- E. Phase conductor color code as follows:
 - 1. Under 250VAC - Black, Red, Blue
 - 2. Over 250VAC - Brown, Orange, Yellow

- F. Joints, Taps, and Splices:
 - 1. Joints, Taps, and Splices in Conductors No. 10 AWG and Smaller: UL listed waterproof compression spring-type solderless connectors with plastic cover and silicone fill for wiring routed outdoors.
 - 2. Manufacturers: American Electric, Blackburn, Burndy, or Thomas and Betts.

2.2 INSTRUMENTATION CABLES

- A. Instrumentation conductors shall be stranded tinned copper conductors, minimum size #18 AWG, polyethylene insulation, No. 18 AWG stranded, tinned copper drain wire with vinyl outer jacket, UL listed.

- B. Instrumentation conductors shall be paired and each pair twisted, and 100% shielded.

- C. Insulation:
 - 1. Installed above grade or inside control panels: instrumentation cables to have minimum 300 volt insulation on each conductor and have a jacket overall.
 - 2. Installed outdoor or below grade: instrumentation cables to have minimum 600V insulation on each conductor and have a jacket overall suitable for direct bury.

- D. Acceptable Manufacturers: Houston Wire and Cable, Belden, or approved.

2.3 DATA INFRASTRUCTURE WIRING:

- A. Unshielded Twisted Pair (UTP) Cabling for industrial applications.
 - 1. UL verified to Category 6 and rated for minimum 1000MB/sec.
 - 2. Paired, 4 pair, 23 AWG, solid bare copper conductors with polypropylene insulation PVC jacket. Outer jacket shall be blue.
 - 3. For Voice/data, Belden 7940A; or equal.
 - 4. Provide plenum rated cable where installed exposed.
 - 5. For outside installations, cables shall be rated for installation in outdoor applications where exposed to the elements. Cables shall have waterblock tape and be suitable for direct burial. Belden 7934A; or equal.
 - 6. For Connection to 480VAC Equipment, cables shall be 600V rated with industrial grade jacket. Belden 7953A; or equal. Connectors and jacks as required.

- B. UTP Patch Cables:
 - 1. Available with RJ-45 style connectors, coordinate lengths with installation requirements.
 - 2. Connectors shall be factory installed, with snagless molded strain relief.
 - 3. Minimum rating Category 6 in accordance with TIA/EIA-568.
 - 4. Field assembled terminations will not be acceptable.

- C. Voice/Data cable jacketing (entire length) shall be color coded as follows:
 - 1. Voice/Telephony - Orange
 - 2. Data Network - White /Off White

- D. Modular jacks shall be color coded as follows:
 - 1. RJ-45 - Match cable jacket color.
- E. Cover plates shall be Office White/ Dusty White (non-metallic).
- F. Acceptable Manufacturers for cover plates and modular jacks: Hubbell, Avaya or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Branch circuit wiring where no conductor size is indicated on the drawings, provide conductors and raceway sized per NFPA 70 and based on the indicated branch circuit overcurrent protective device (OCPD) rating and number of poles.
- B. Where "home run" routing is indicated on the drawings, with destination designation, provide conductors and raceway as required to complete the circuit to the destination device/equipment.

3.2 LOW VOLTAGE LIGHTING AND POWER CABLES

- A. Install only after completion of work, which might cause damage to wires or conduit.
- B. Clean out or replace conduit in which dirt, water, concrete, or other foreign matter has been allowed to accumulate, before installing wiring.
- C. Use THHN or tray rated cable and wire for routing in cable tray.
- D. Identify each end of each conductor by wire marking tape or sleeve. Mark on outer cover giving voltage, type, size and circuit number.
- E. Splices:
 - 1. No wire splices allowed in entire length of conduit or raceway.
 - 2. Make splices in electrical enclosures.
 - 3. Splice Insulation: Equal to original factory insulation.
 - 4. Splicing Copper to Aluminum: Use aluminum-copper connections; approved as suitable for the purpose.
- F. Termination of Conductors:
 - 1. Insulated type compression lugs.
 - 2. At distribution equipment containing aluminum bus bars, use aluminum copper lugs rated and approved for the application.
- G. Provide separate conduit for each type of circuit (power, controls, and communications).
- H. Conductors terminating at outlets shall be left not less than 8 inches long within outlet box.
- I. Low voltage and signal cable splices located in handholes and wet locations shall be sealed in 2-part epoxy sealing pack, 3M Scotchcast connector sealing pack 3570G.

3.3 INSTRUMENTATION CABLE

- A. Install only after completion of work, which might cause damage to wires or conduit.
- B. Clean out or replace conduit in which dirt, water, concrete, or other foreign matter has been allowed to accumulate, before installing wiring.
- C. Splices: No wire splices allowed in entire length of conduit or raceway.
- D. Provide separate conduit for instrumentation circuits.
- E. Mark on outer cover the control loop number at each end and each conductor the wire number by wire marking tape or sleeve.
- F. Use heat shrink tubing for all instrument signal cable terminations.
- G. RF cable shall be installed in metal conduit.

3.4 FIREPROOFING OF CABLES

- A. Fireproofing of wires and cables shall be accomplished by half lapped taping using electrical arc and fireproofing tape made of heat resistant organic coated on one side with a flame retardant elastomer. The fireproofing tape shall be held in place by spiral wrapping at 18-inch intervals using pressure sensitive glass cloth tape 2 inches in width.

3.5 GROUPING OF CABLES

- A. Lace or plastic band groups of feeder conductors at distribution centers, pull boxes and wire ways.

3.6 WIRE PULLING

- A. Use wire pulling lubricant for pulling (No. 4 AWG) and larger wire. Do not pull cables through conduit with more than allowable bends specified in NEC 345-11. Only approved pulling compound that is suitable for the type wire insulation is allowed.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 DESCRIPTION

- A. The work of this section includes equipment for an effective grounding system.

1.3 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Certified ground resistance tests on each ground rod and the complete service system consisting of multiple rods and grounding conductor.
- C. Ground resistance tests on total systems.

1.4 STANDARDS

- A. IEEE Standard 142.
- B. NEC Article 250.

PART 2 - PRODUCTS

2.1 GROUNDING ELECTRODE

- A. Grounding electrode to be ground rods.
- B. Ground rods shall be bonded copper type steel core with thick copper covering inseparably bonded together 3/4" diameter x 10' length. Ground rod couplings are to be used if rod length of greater than 10 feet is required.

2.2 GROUNDING CONNECTIONS

- A. To be thermoweld when concealed or where required by Owner.
- B. To be mechanical where allowed by code and where exposed to view.
- C. Where the grounding conductor penetrates a concrete surface use a 5/8" solid copperweld rod or a thermoweld antisyphon water stop.

2.3 GROUNDING ELECTRODE CONDUCTOR

- A. Grounding electrode conductor is to be as shown and sized in accordance with Table 250-66 of NEC.

2.4 EQUIPMENT GROUNDING CONDUCTORS

- A. Equipment grounding conductors shall be copper sized in accordance with Table 250-122 of NEC.

PART 3 - EXECUTION

3.1 DISTRIBUTION SYSTEM GROUNDING

- A. Circuit Grounding: Install grounding bushings, grounding studs, and grounding jumpers at distribution centers, pull boxes, motor control centers, and panelboards.
- B. Bonding Jumpers:
 - 1. Provide green insulation, size correlated with overcurrent device protecting the wire, attached to grounding bushings on conduits, to lugs on boxes, and other enclosures.
 - 2. Bond to neutral only at service neutral bar.
- C. FMC and LTFMC: Install separate grounding conductor in FMC and LTFMC. Connect each end to a grounding bushing.
- D. Receptacles and Power Outlets: Ground receptacles and power outlets to the conduit system with a Type THHN green grounding conductor sized in accordance with NEC Article 250 and connected between the device grounding screw and outlet box.
- E. Metallic Conduit: When grounding conductors are enclosed in metallic conduit, the conduit shall be bonded to the grounding conductors at both ends.
- F. Nonmetallic Conduit: Install separate ground conductor in conduit runs.
- G. Expansion Joints: Install a bonding jumper around expansion fittings in metallic conduit to maintain ground continuity.

3.2 FIELD QUALITY CONTROL

- A. Ground resistance tests of each ground rod shall be made and results signed as correct by the Contractor.
- B. Provide grounding with ground rods of length required to achieve specified ground resistance of 25 ohms or less (per ground rod). Use three rods driven in triangle formation and connected in parallel. Provide ground rods at location shown (multiple rods may be required to achieve specified resistance).
- C. Bond the non-current carrying parts of all electrical equipment installed under this contract including metallic raceways, raceway supports, motors, equipment enclosures, and metallic cable sheaths by means of bare copper cable or copper strap to the station grounding system or as shown.
- D. Install grounding bars in rooms housing service equipment, and elsewhere as indicated. Install bus on insulated spacers 1 inch, minimum, from wall 12 inches above finished floor, unless otherwise indicated. Utilize non-reversible connectors for connection of all required components of the grounding electrode system. Size all conductors per NEC requirements, #4 AWG minimum. Route all conductors to/from grounding bars in conduit. Signal and

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GROUNDING AND BONDING

communication equipment, and flowmeter connections to be made with insulated grounding conductor in conduit.

- E. All power, lighting over 120 volts and receptacle circuit conduits shall include a ground conductor sized per the NEC. Attach grounding conductors to equipment by means of approved copper alloy solderless grounding lugs or clamps which shall be secured to the equipment and the grounding point by means of hexhead cap screws or machine bolts after the contact surfaces have been cleaned to bright metal.
- F. Ground conductors run in conduit with circuit conductors are to be securely connected inside the junction boxes or enclosures. Splices in ground conductors shall be made by the "Cadweld" process by Erico Products, Inc., Continental Industries "Thermoweld", or equal.
- G. Support ground straps at intervals not exceeding two (2) feet by means of round head bronze machine screws and approved type anchors.
- H. Electrical grounding system in well houses are to be grounded to the metallic well casing.
- I. All circuits in non-metallic raceways shall include a ground conductor sized per the NEC or as shown. Attach grounding conductors to equipment by means of hexhead cap screws or machine bolts after the contact surfaces have been cleaned to bright metal. Ground conductors terminating at the motor control centers, switch gear, to be terminated at the ground bus.
- J. Bond grounding electrode to water pipe main, building foundation steel and all other acceptable locations as required per the NEC Article 250. Provide braided type bonding jumpers to electrically bypass water meter and all other non-conductive or removable components.
- K. Metal Site Lighting Poles: Provide ground conductor with power circuits to all light poles and properly connect the ground to the metal pole.
- L. Ground Rods: Locate a minimum of one-rod length from each other and at least the same distance from any other grounding electrode. Interconnect ground rods with bare conductors buried at least 24 inches below grade. Connect bare-cable ground conductors to ground rods by means of exothermic welds except as otherwise indicated. Make these connections without damaging the copper coating or exposing the steel. Drive rods until tops are 6 inches below finished floor or final grade except as otherwise indicated.
- M. Bond interior metal piping systems and metal air ducts to equipment ground conductors of pumps, fans, and electric heaters.
- N. Exothermic Welded Connections: Use for connections to structural steel and for underground connections. Install at connections to ground rods and plate electrodes. Comply with manufacturer's written recommendations. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- O. Compression-Type Connections: Use for above grade and exposed connections. Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by the connector manufacturer. Provide embossing die code or other standard method to make visible indication that a connector has been adequately compressed on grounding conductor.

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- P. Signal and Communications: For telephone, alarms, and communication systems, provide a #4 AWG minimum green insulated copper conductor in raceway from the grounding electrode system to each terminal cabinet or central equipment location.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 SUMMARY

- A. Section Includes:
 - 1. Conduit supports.
 - 2. Formed steel channel.
 - 3. Spring steel clips.
 - 4. Sleeves.
 - 5. Mechanical sleeve seals.
 - 6. Equipment bases and supports.

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. Accept materials onsite in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Hangers and supports shall match or exceed the corrosion resistance of conduit material.

2.2 CONDUIT SUPPORTS

- A. Hanger Rods: Threaded high tensile strength galvanized carbon/stainless steel with free running threads.
- B. Non-Metallic: PVC or other nonmetallic straps as recommended by the conduit manufacturer for the non-metallic conduit. Any metallic screws, bolts, nuts, or other attachment hardware to be stainless steel.
- C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- D. Conduit clamps for trapeze hangers: Galvanized steel notched to fit trapeze with single bolt to tighten.

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- E. Conduit Clamps-General Purpose: One-hole malleable iron for surface mounted conduits.
- F. Cable Ties: High strength nylon temperature rated to 185°F. Self-locking.

2.3 FORMED STRUT CHANNEL

- A. Product Description:
 - 1. Hot-dip Galvanized or 316 Stainless Steel, 12 gage thick steel 1-5/8" x 1-5/8". Solid or with holes 1-1/2 inches on center.
 - 2. Fiberglass, 1-5/8" x 1-5/8" x 1/4", pultruded single channel or back-to-back as required for loading.

2.4 SPRING STEEL CLIPS

- A. Product Description: Mounting hole and screw closure. Galvanized or stainless steel.

2.5 SLEEVES

- A. Sleeves through non-fire rated floors: 18 gauge thick galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of existing conditions before starting work.
- B. Coordinate sleeve installation with other trades. Verify openings are ready to receive sleeves.

3.2 INSTALLATION - HANGERS AND SUPPORTS

- A. Corrosive Environments: Utilize metallic PVC coated fittings compatible with PVC coated conduit. Provide stainless steel fasteners.
- B. Anchors and Fasteners:
 - 1. Concrete Structural Elements: Provide precast inserts, expansion anchors, powder actuated anchors and preset inserts.
 - 2. Steel Structural Elements: Provide beam clamps and steel ramset fasteners.
 - 3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors.
 - 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts and hollow wall fasteners.
 - 5. Solid Masonry Walls: Provide expansion anchors and preset inserts.
 - 6. Sheet Metal: Provide sheet metal screws.
 - 7. Wood Elements: Provide wood screws.
- C. Inserts:
 - 1. Install inserts for placement in concrete forms.
 - 2. Install 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.

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5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.
- D. Install conduit and raceway support and spacing in accordance with NEC.
- E. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
- F. Install multiple conduit runs on common hangers.
- G. Supports:
 1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
 2. Install surface mounted cabinets and panelboards with minimum of four anchors.
 3. In wet and damp locations install stainless steel channel supports to stand cabinets and panelboards 1 inch off wall.
 4. Support vertical conduit at every floor, minimum.

3.3 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 4 inches thick and extending at least 4 inches beyond, but not more than 6 inches, furthest outward extrusion on the supported equipment.
- B. Using templates furnished with equipment, install channel and anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of formed steel channel. Brace and fasten with flanges bolted to structure.
- D. Bases/pads poured on grade shall have minimum rebar reinforcement. Field coordinate requirements with Engineer.

3.4 INSTALLATION - SLEEVES

- A. General: All conduits routed thru concrete shall be sleeved.
- B. Exterior/corrosive area, watertight and below grade entries: Seal with adjustable interlocking rubber links both sides.
- C. Conduit penetrations in non-corrosive area are not required to be watertight: Sleeve and fill with silicon foam.
- D. Set sleeves in position in forms. Provide reinforcing around sleeves. Field coordinate requirements with Engineer.
- E. Size sleeves large enough to allow for movement due to expansion and contraction.
- F. Extend sleeves through floors 2 inch above finished floor level. Caulk sleeves.
- G. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with stuffing or fire stopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

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H. Install chrome plated steel escutcheons at finished surfaces.

3.5 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 DESCRIPTION

- A. Work of this section includes electrical raceway systems.

1.3 SUBMITTALS:

- A. Submit under provision of Division 1.

1.4 RELATED WORK:

- A. Section 26 05 34 - Electrical Boxes.

PART 2 - PRODUCTS

2.1 CONDUIT

- A. Rigid Metal Conduit (RMC):
 - 1. Unless otherwise detailed or specified elsewhere in the specifications or drawings, conduit for all locations shall be RMC.
 - 2. RMC shall be threaded, hot dipped galvanized inside and out conforming to UL Standard 6 and ANSI C80.1.
 - 3. Acceptable manufacturers: Allied Tube & Conduit, Republic, and Wheatland Tube.
- B. Intermediate Metal Conduit (IMC):
 - 1. IMC shall be galvanized, threaded, conforming to UL 1242 and ANSI C80.6.
 - 2. Intermediate metal conduit may be used in lieu of rigid steel conduit.
 - 3. Acceptable manufacturers: Allied Tube & Conduit, Republic, and Wheatland Tube.
- C. Electrical Metal Tubing (EMT):
 - 1. EMT shall be galvanized conforming to UL 797 and ANSI C80.3.
 - 2. Electrical metal tubing may be used in dry areas only.
 - 3. Acceptable manufacturers: Allied Tube & Conduit, Republic, and Wheatland Tube.
- D. Rigid Nonmetallic Conduit:
 - 1. Rigid nonmetallic conduit shall be PVC Schedule 40 or Schedule 80 heavy wall, rated for 90°C conductors and for use in direct sunlight conforming to UL 651 and Federal Specification W-C-1094A.
 - 2. Use only couplings and fittings designed specifically for the type of conduit noted. Follow the manufacturer's recommendations regarding the handling, bending, coupling and installation.

- E. Liquid-tight Flexible Metal Conduit:
 - 1. Liquid-tight flexible metal conduit shall have flexible interlocking steel, spiral strip, galvanized with oilproof and waterproof flexible PVC jacket, conforming to UL standards.

2.2 COUPLINGS AND CONNECTORS

- A. Provide rigid threaded, galvanized, compatible with galvanized rigid steel conduit.
- B. For intermediate metal conduits, provide IMC couplings galvanized, threaded, and of the same manufacturer.
- C. For electrical metal tubing, couplings and connectors to be steel set screw type, and of the same manufacturer.
- D. For rigid non-metallic PVC conduit, couplings to be PVC, liquid tight, suitable for the conduit with which the couplings are used and of the same manufacturer.
- E. Flexible conduit connectors shall be compression gland, liquid tight type.
- F. Connectors to metallic boxes or conversion to metallic conduit: Provide adapters as recommended by conduit manufacturer to provide a watertight threaded connection.

2.3 FITTINGS AND CONDUIT BODIES

- A. UL listed.
- B. For metallic conduit, liquid tight, malleable iron alloy body and cover, zinc coated and stainless-steel screws.
- C. For nonmetallic conduit, liquid tight, utilizing the same non-metallic material as used in the conduit for body and the cover. Cover screws shall be stainless steel.

2.4 CLAMPS & HANGERS

- A. Hot dipped galvanized malleable iron straps with back spacers, and hot dipped galvanized strap hangers with zinc plated threaded rods and hardware.
- B. PVC or other nonmetallic straps as recommended by the conduit manufacturer for the non-metallic conduit. Any metallic screws, bolts, nuts or other attachment hardware to be stainless steel.
- C. Trapeze type hangers shall be:
 - 1. For galvanized conduit, use galvanized steel channel, 12 gauge minimum, support system with (zinc plated) threaded rod and hardware as manufactured by Super-Strut or Unistrut.
 - 2. For nonmetallic conduit, use fiberglass strut support system or PVC coated strut support system with plastic coated or stainless steel hardware.

2.5 CONDUIT SEALING FITTINGS

- A. Sealing compounds used for conduit sealing fittings shall be permanent and shall be recommended by conduit fitting manufacturer as suitable for sealing fitting in (classified) locations.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install the conduit in accordance with the manufacturer's recommendations. All buried conduits outside of buildings shall have locations marked on drawings. Minimum conduit size shall be 3/4". In no event shall the conduit size be less than required by National Electric Code (NEC) for the wire size and number indicated.
- B. Utilization Areas:
 - 1. Use RMC for main service distribution conduits surface mounted in all areas not described below.
 - 2. Use IMC in all exterior surface mounted areas located outdoors or on the exterior of buildings.
 - 3. Use EMT for all indoor concealed areas inside walls, above ceilings, and in concealed spaces.
 - 4. Use PVC Schedule 80 conduit for underground construction and exposed areas of chemical storage rooms.
 - 5. Use PVC Schedule 40 conduit for under-ground-under-slab construction.
 - 6. Use Liquid-tight Flexible Metal Conduit for:
 - a. Motor terminations.
 - b. Termination to instrumentation and control field devices.
 - c. Installation not to exceed 3 ft.
- C. General Installation Guidelines:
 - 1. All conductors shall be installed in raceway. If requirements are unclear, coordinate with Engineer prior to bidding.
 - 2. Metal conduit systems shall be bonded to grounding systems at each enclosure.
 - 3. Run conduit parallel to or at right angles to building lines, except when in concrete slab or run under base slab. Support conduit at a maximum of 8 feet on center.
 - 4. Installation of conduit in concrete slabs and walls shall maintain two times (2x) the conduit diameter spacing between conduits. Maintain a distance of 3" from floor openings and wall penetrations. Maintain a minimum of 3" below all finished concrete surfaces.
 - 5. Bends for low voltage wiring shall be standard ells with a maximum equivalent of four (4) quarter bends in any run between pulling joints. Bends for medium voltage wiring shall be wide radius ells with a maximum equivalent of three (3) quarter bends in any run between pulling joints.
 - 6. Paint the ends of RMC/IMC joint couplings or threaded fittings with zinc rich coating of at least 90% purity zinc. Use cold galvanizing compounding ZRC Products Co., Zinc-It, or equal.
 - 7. Fasten all conduits entering boxes with locknut and bushing in the inside and locknut on the outside.
 - 8. Furnish and install liquid-tight flexible metal conduit connections to all motors, solenoids and vibrating equipment. Conduit shall be a minimum 18 inches in length and shall be sufficiently long to enable motor to be moved to allow the

disconnecting of the motor coupling without disconnecting the motor and shall be equipped with approved type grounding devices to ensure continuity between the conduit and the connection. In all cases, liquid-tight flexible metal conduit runs shall not exceed 6 feet in total length.

9. Clean all conduit thoroughly inside and outside after installation and just before pulling cables. All conduits not terminated in metal fittings or metal cabinets and secured with locknuts shall be terminated with grounding bushings.
10. Install only undamaged conduit. Plug ends to prevent entry of dirt and moisture.
11. Layout conduit routing to avoid structural obstructions and minimizing crossovers. Conduit runs must be installed in a neat and well-planned arrangement and in a manner that will not interfere with access to equipment or with the use of access ways.
12. Provide conduit sealing fittings and seal conduit with duct seal where conduits leave heated area and enter unheated area.
13. Provide flashing and pitchpockets in making watertight joints where conduits pass through roof or waterproofing membranes.
14. Install UL approved expansion fittings complete with grounding jumpers where conduits, metallic or non-metallic cross building expansion joints. Provide bends or offsets in conduit adjacent to building expansion joints where conduit is installed above suspended ceilings. In exposed PVC conduit runs longer than 50 feet, provide expansion couplings near boxes or devices. In exposed PVC conduit runs which do not have devices or boxes, an expansion coupling shall be installed for every 100 lineal feet of conduit.
15. Whenever PVC is used, install a separate ground wire, and use rigid ells where exterior or poured concrete surfaces are penetrated. Also, provide rigid elbows where necessary to prevent "burn-through" of PVC conduit when pulling wire.
16. Make transitions between nonmetallic conduits and conduits of other materials with the manufacturer's standard adapters designed for such purposes.
17. Conduit shall be securely attached to the building structure. Unless otherwise indicated, all electrical equipment shall be spaced at least 1/2 inch from the wall with hanger clamps to Unistrut, Super Strut, or equal.
18. For single metallic conduit runs use galvanized conduit straps or ring bolt type hangers with specialty spring clips. Perforated strap is not allowed. Groups of conduits shall be supported on trapeze type hangers, Unistrut, or equal. Individual conduits not supported on conduit straps shall be provided with clevis type hangers. Hanger support shall be rod with threaded connections.
19. Conduit entering control panels shall not be made where conductors will obstruct internal components and shall allow for neat and workmanlike wire management.
20. Provide listed sealant in underground and above grade conduit exposed to temperature differences to prevent the passage of air and condensation.
21. Conduits shall enter all slab on grade buildings thru the slab and not above grade thru the building wall. Saw cut slab and patch as required.

D. Anchor Methods:

1. Hollow Masonry: Toggle bolts or spider type expansion anchors.
2. Solid Masonry: Lead expansion anchors or preset inserts.
3. Metal Surfaces: Machine screws, bolts, or welded studs.
4. Wood Surfaces: Wood screws.
5. Concrete Surfaces: Self-drilling anchors or power-driven studs.

E. Conduit runs as indicated on drawings are schematic, exact routing of conduit to be approved by the Engineer. Make field bends and offsets uniform and symmetrical, without

flattening conduit or scarring conduit finish and of minimum radius for each size as given in NEC Article 346.

- F. Conduit shall be as shown on plans and/or as required for the installation of outlets and devices shown on drawings. All conduits shall be supported from the structure or provided rods independent of all other trades. Proper location of conduits shall be the responsibility of the Electrical Contractor who shall avoid interferences with other trades.
- G. Install a 500 lb. tensile strength pull cord/wire in all empty conduits. All empty conduits installed for future use shall be capped or plugged and properly identified with sleeve label.
- H. Drains are required where it is probable that liquid or any condensed vapor may be trapped within enclosures, accumulated on seals, or accumulated at any point in the raceway system. All drains shall provide continuous draining. Drains shall be provided as follows:
 - 1. At the low points of any conduit system where any portion between seals is outdoors or in a building without heating facilities. Note especially any vertical sealing fittings.
 - 2. At any control or wiring enclosure that is outdoors or in a building without heating facilities.
- I. For conduits that enter NEMA Type 2, 3, 3R, 4, 4X, and 12 enclosures, provide Myers type conduit hub type fittings with O-ring gaskets suitable for the environment served. Grounding hubs shall be used with nonmetallic enclosures.
- J. Installation of buried duct or conduit.
 - 1. Comply with the NEC as applicable to underground duct construction and installation.
 - 2. Excavation and Trenching
 - a. Excavation shall include all necessary clearing of the excavation areas, all grubbing, all wet, dry, and rock excavation, the removal of substructures such as wall, piers, footings and incidental work such as sheet piling, shoring, underpinning, pumping and bailing, and transportation.
 - b. The Contractor shall excavate whatever materials are encountered as required to place the new construction at the finished elevations shown in the drawings.
 - c. The Contractor shall excavate a minimum of 4 inches below the final duct line grade to accommodate the pouring of a concrete base.
 - d. The Contractor shall provide adequate shoring, sheet piling and bracing to prevent earth from caving or washing into excavation and shall do all shoring and underpinning necessary to properly support adjacent or adjoining structures. All shoring, sheet piling and underpinning must be subject to the approval of the Engineer, but his approval shall not relieve the Contractor of responsibility for the protection of life and property related to the work.
 - e. It is an absolute requirement that all ducts shall drain, either to manholes or to buildings. Bottom of trench shall be graded to provide this drainage. Minimum slope for drainage shall be 6 inches per 100 feet. No pockets shall be permitted and any such conditions found shall be re-graded.
 - f. Trenches shall be cut on a transit line and be perfectly straight. Spill banks shall be at least 2 feet from edge of trench. All loose dirt shall be removed from edge of trench before duct installation. Any loose dirt which falls into the trench during or after the duct installation shall be removed by this Contractor before pouring concrete encasement.

- g. Each excavated section (from manhole to manhole or to building) shall be completely excavated and graded before ducts are laid, with the exception of street (or road) crossings which are shown on the plan.
 - h. Where it is necessary for electrical duct line to cross excavations made by others, this Contractor shall furnish and install compacted sand backfill to grade at bottom of duct trench. No electrical ducts shall be placed on the dirt backfill.
 - i. Gas laterals and telephone cables which cannot be cleared by slight raising or lowering of conduit shall be relocated by the utility company involved. Contractor shall pay utility cost of relocation.
 - j. Storm, sanitary sewers, and water lines which require relocation or repair shall be relocated and/or repaired by this Contractor to the satisfaction of the owner.
 - k. Water, gas, sewer, electric or steam lines encountered in the excavation shall not be disturbed and shall be properly underpinned and supported. Contractor shall exercise special care at locations of existing utilities as shown in the drawings.
 - l. The Contractor shall provide, operate and maintain all pumps or other equipment necessary to drain and keep all excavation pits and trenches and the entire subgrade area free from water under any and all circumstances that may arise in accordance with the plan or original design.
3. Filling and Backfilling (where not provided by other trades)
- a. The bottom of trenches and other areas which are below the finished grades shall be filled with sand. Filling must be deposited in horizontal layers and compacted sufficiently to prevent settlement. Machine compaction shall be used.
 - b. Backfill on top of the new duct installation shall be clean, excavated earth, free from rock, debris, frozen materials, etc. Backfill shall be placed in 6-inch layers and compacted. The Contractor shall hand rake the area in the vicinity of excavations restoring 6 inches from original grade and removing rocks and debris. Final grade will be by the Contractor.
4. Conduit and Duct
- a. Where conduits enter manholes or building basement walls, provide end bells flush with inside wall of manhole or building basement wall. Each conduit wall penetration shall be made watertight. All penetrations shall be core-drilled sufficiently large to accommodate conduit plus flush mounted end bell. The duct bank shall be sufficiently doweled to the structure using epoxy bonded dowel rods to improve sheer stress at the point of entrance. The concrete should be vibrated during installation to penetrate around conduits and seal against end bells.
 - b. If trenches become flooded or partially filled with dirt after ducts are laid, the Contractor shall remove and clean all ducts, clean out and re-install the ducts. The Contractor shall pump water, dry out the trench, re-excavate and form.
 - c. The Contractor shall core drill holes in existing footings, walls, manholes, and waterproof same after new conduits are installed.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 DESCRIPTION

- A. Work of this section includes junction boxes, pull boxes, and outlet boxes for interior and exterior locations.

1.3 RELATED SECTIONS

- A. Section 26 05 33 - Conduit.

PART 2 - PRODUCTS

2.1 JUNCTION, PULL, AND OUTLET BOXES

- A. All boxes used with rigid steel galvanized conduits shall have malleable iron body and cover with stainless steel screws. The finish shall be zinc electroplate and aluminum polymer enamel.
- B. All exposed boxes used indoors with intermediate steel galvanized conduits shall have malleable iron body and cover with stainless steel screws. The finish shall be zinc electroplate and aluminum polymer enamel.
- C. All concealed boxes used indoors with intermediate steel galvanized conduits shall be pressed steel hot dip galvanized as specified in Part C below.
- D. Junction boxes set flush in interior concrete ceiling and walls shall be PVC.
- E. Junction boxes set flush in exterior walls or in exterior concrete slabs shall be hot dipped galvanized cast iron. Cover shall be same material as box with checkered plating design and neoprene gasket. Box shall be an O-Z Gedney Type Y-T or equal by Appleton. Box shall have a minimum 6" depth.
- F. Junction and pull boxes used with non-metallic conduits shall be (PVC).
- G. All boxes shall be UL listed and conforming to area classification. Boxes shall be NEMA 4 (minimum) for outdoor, wet, or corrosive environments unless specified otherwise on drawings.

2.2 OUTDOOR GROUND BOXES

- A. Ground box shall provide a watertight housing to install electrical receptacles and data communication outlets flush in exterior surfaces including grass, landscaping, concrete, paver systems, etc.
- B. Ground box shall be a watertight enclosure (box and cover) constructed of UV and chemical resistant F1 non-metallic materials.

- C. Assembly shall be UL50E Type 6P rated for year-round use and rated IP68 while in use.
- D. Ground Box and cover shall be ANSI/SCTE 77 Tier 5 rating and can hold up to 5,000 lbs. of load allowing for the occasional tractor or non-deliberate vehicular traffic.
- E. Box shall be equipped with a cover that allows for watertight closure while cables are connected. Cover shall be provided with a tamper-resistant lock when not in use.
- F. Box shall be capable of a 2-gang receptacle assembly. Provide weather resistant style receptacles as specified in Section 26 27 26
- G. Cover shall be gray finish.
- H. Acceptable Manufacturers: Legrand Wiremold Model XB814 or Engineer approved equal.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Clean interior of boxes of moisture, dirt, metal filings or other foreign matter.
- B. Assure that all conduit fittings that enter the box are tight and secure.
- C. Locate boxes in walls and on other surfaces as shown on the drawings.
- D. In rooms and areas having a corrosive atmosphere use only PVC or molded fiberglass boxes.
- E. Coordinate installation of poured-in-place flush or exterior ground junction boxes with other trades.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 SUMMARY

- A. This section includes electrical identification of electrical materials, equipment and installations. It includes requirements for electrical identification components including but not limited to the following:
 - 1. Buried electrical line warnings.
 - 2. Identification labeling for raceways, cables and conductors.
 - 3. Operational instruction signs.
 - 4. Warning and caution signs.
 - 5. Equipment labels and signs.
 - 6. Spare future conduits.
- B. Refer to other Division 26 sections for additional specific electrical identification associated with specific items.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI C2.
- B. Comply with NFPA 70.
- C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.1 CABLE LABELS

- A. All conductors and cables are to be labeled. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with preprinted numbers and letters.
- C. Color: Black letters on white field.
- D. Label Information: Indicate voltage and if applicable service.

2.2 NAMEPLATES AND SIGNS

- A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.
- B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch thick for signs up to 20 sq. in, or 8 inches in length; and 1/8 inch thick for larger sizes.

- C. Color: Black letters on white face except for emergency systems listed in NFPA 70, Article 700, or as directed by the owner.
- D. Nameplates shall be punched or drilled for mechanical fasteners.
- E. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, non-fading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.
- F. Fasteners for Nameplates and Signs: Self-tapping, stainless steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.3 UNDERGROUND LABELS

- A. Underground line marking tape: Permanent, bright-colored, continuous printed, plastic tape compounded for direct-burial service not less than 6 inches wide by 4 mils thick. Printed legend indicative of general type of underground line below.

2.4 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Self-Adhesive Tape: Electronic label maker, imprinted, pressure sensitive, abrasion resistant plastic tape.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Provide identification signs on all equipment enclosures, switches, breakers, and panels.
 - 2. Attach nameplates directly to each piece of electrical equipment.
 - 3. Where several conductors pass through a pull box, junction box, or enclosure, provide wire labels. Group wires before labeling.
- B. Service Equipment:
 - 1. "Service Disconnect" label.
 - 2. Location/Description of other Service Disconnects, where more than one.
 - 3. Short Circuit Current Rating (SCCR).
 - 4. Voltage rating (Orange label/ Black Text).
- C. Panelboards:
 - 1. Name of device as indicated on one-line diagram, voltage-phase, and upstream OCP location (example, "LPA, 208Y/120V-3Ø, FED FROM MCC-A").
 - 2. Provide a type written circuit identification schedule in each distribution or branch circuit panelboard under glass or plastic. Each circuit to be identified by load.
- D. Enclosed Switches, Enclosed Controllers (Motor Starters), and Variable Frequency Drives: Name of equipment served, load /size and upstream OCP location, e.g., "EF-5, 5 HP, FED FROM MDP-A".

SECTION 26 05 53
ELECTRICAL IDENTIFICATION

- E. Transformers: Name of device as indicated on one line diagram, KVA rating, primary voltage: secondary voltage, source transformer is fed from, and load transformer feeds, e.g., "T LPA, 45 KVA, 480:208Y/120V, FED FROM MCC, FEEDS PANEL LPA".
- F. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment in accordance with manufacturer's written instructions and requirements of NEC.
- G. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding specified or indicated. Install numbers, lettering and colors as approved in submittals and as required by code.
- H. Identify high-voltage feeder conduits (over 600V) by words "DANGER-HIGH VOLTAGE KEEP OUT" in black letters 2 inches tall, stenciled at 10-foot intervals over painted orange background.
- I. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.
- J. Self-Adhesive Identification Products: Clean surfaces before applying.
- K. Install nameplates and labels parallel to equipment lines.
- L. Identify junction, pull and connection boxes: Code required caution sign for boxes shall be pressure-sensitive, self-adhesive label indicating system voltage in black, preprinted on orange background. Install on outside of box cover. Also label box covers with identity of contained circuits. Use pressure sensitive plastic labels at exposed locations and similar labels or plasticized card stock tags at concealed boxes.
- M. All surface and flush mounted wiring devices (light switches, receptacles, etc.) shall have the power circuit identified, in permanent marker or pen, on the back (inside) of the device cover plate.
- N. Underground electrical line identification: During trench backfilling for exterior underground power, signal and communication lines, install continuous underground plastic line marker, located 12 inches directly above conduit. Where multiple lines installed in a common trench or concrete envelope do not exceed an overall width of 16 inches, install a single line marker.
- O. Labeling Legend: List panel and circuit number or equivalent in a legible manner.
- P. Color Coding of Secondary Phase Conductors: Refer to Section 26 05 19.
- Q. Wiring for control systems shall be color coded in accordance with wiring diagrams furnished with the equipment.
- R. Tag or label conductors as follows:
 - 1. Future connections: Conductors indicated to be for future connection or connection under another contract with identification indicating source and circuit numbers.
 - 2. Multiple circuits: Where multiple branch circuits or control wiring or communications/signal conductors are present in the same box or enclosure (except for three-circuit, four-wire home runs), label each conductor or cable. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring. Phase and voltage of branch circuit wiring may be indicated by

- means of coded color of conductor insulation. For control and communication/ signal wiring, use color coding or wire/cable marking tape at terminations and at intermediate locations where conductors appear in wiring boxes, troughs and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tapes.
3. Motor Leads: Provide label on each end of conductor including motor starter number and motor starter terminal number.
 4. Motor Control Center Control Circuits: Provide labels on each end of conductor including motor starter number and motor starter terminal number for all field control circuits.
 5. Instrument Control Panel Circuits: Provide labels on each end of conductor with the same naming convention as that located in the source control panel. Provide a label suffix corresponding with the instrument control panel circuit originates from.
- S. Factory apply color the entire length of conductors except the following field applied color coding methods may be used instead of factory coded wire for sizes larger than No. 10 AWG.
- T. Colored, pressure-sensitive plastic tape in half lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
- U. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
- V. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8 inch high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.
- W. Switch Identification Labels: Self-Adhesive Tape. Install on each switch when there are more than two switches under one faceplate or if switches are used to control exhaust fans or other equipment. Unless otherwise indicated, provide a single line of text with 1/8-inch high black lettering on clear background. Label shall indicate load controlled.
- X. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers and similar items for power distribution and control components above, except panelboards and alarm/signal components where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.
- Y. Furnish and install a sign at the service entrance equipment indicating type and locations of on-site emergency power sources. Sign shall be 8x10-inch minimum size mounted on the face on the switchboard.
- Z. Provide suitable permanent means of labeling spare conduits. Provide legible means of identifying the location of where each conduit originates. Provide the same identification at each end.

SECTION 26 05 53
ELECTRICAL IDENTIFICATION

- AA. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2 inch high lettering on 1-1/2 inch high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories (not all categories may be required on the project) of equipment using mechanical fasteners:
1. Panelboards, electrical cabinets, and enclosures. Include series rated labeling if required.
 2. Access doors and panels for concealed electrical items.
 3. Electrical switchgear and switchboards. Include series rated labeling if required.
 4. Emergency system boxes and enclosures.
 5. Motor control centers.
 6. Disconnect switches.
 7. Enclosed circuit breakers.
 8. Motor starters.
 9. Pushbutton stations.
 10. Contactors.
 11. Remote controlled switches.
 12. Control devices.
 13. Transformers.
 14. Lighting control system panels
 15. Timers/time clocks.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 SUMMARY

- A. The work covered in this section includes lighting control systems for interior and exterior building lighting.
- B. Electrical Contractor shall coordinate all work in this section with all of the trades covered in other sections of the specification to provide a complete operable system.

1.3 RELATED SECTIONS

- A. Section 26 51 00 - Lighting

1.4 STANDARDS

- A. NEC Compliance - Comply with NEC as applicable to electrical wiring work.
- B. NEMA Compliance - Comply with applicable portions of NEMA Standards pertaining to types of electrical equipment and enclosures.
- C. Michigan Energy Code compliance - Installation must meet requirements of ASHRAE 90.1-2013.
- D. FCC Emissions - All assemblies are to comply with FCC emissions Standards specified in Part 15 for Class A application. Telephone override system shall also comply with standards specified in Part 68.
- E. Component Pre-testing - All components and assemblies are to be factory pre-tested and burned-in prior to installation.
- F. System Checkout - Factory trained technicians shall be available to functionally test system after installation to verify proper operation and confirm that the enclosure wiring and addressing conform to the wiring documentation.
- G. System Support - Factory trained application engineers shall be available for onsite training as well as telephone support.

1.5 SUBMITTALS

- A. Submit under provisions of Section 26 05 00 and Division 1.
- B. Submittal documentation shall be furnished by the manufacturer for approval by the Engineer and must be approved in writing prior to shipment of any equipment from the manufacturer.

- C. Bill of Materials - Manufacturer shall submit in bill of material form an itemized list of all materials being supplied to meet the specifications.
- D. Product Data - Manufacturer shall submit data on each of the components proposed for the low voltage lighting control system.
- E. Typical Wiring Diagrams - Submit typical wiring diagrams for all proposed equipment with sufficient details for all interconnections.
- F. Layout drawings indicating proposed locations of all lighting control components.

1.6 SUPPORT SERVICES:

- A. Local Support - The manufacturer shall have service representatives within a 50-mile radius of the installation.
- B. Commissioning - After the system has been installed the contractor shall secure the services of a factory trained representative of the manufacturer to verify correct operation of all system components. The factory trained representatives shall verify that the contractor has properly installed and interconnected all supplied components. They shall start up all equipment and demonstrate that it meets the requirements of this specification.
- C. Training - As part of the commissioning procedures, the manufacturer shall provide a minimum of 2 hours training for the Owner's representatives in the operation and control of the system.
- D. Technical Support - The manufacturer shall provide free telephone support to the owner for the duration of the warranty period.
- E. Extended Service Coverage - Maintenance agreements shall be available from the manufacturer to provide service for the system both during and after the warranty period.

1.7 WARRANTY

- A. Installation Warranty - The installing contractor shall provide a written warranty agreeing to provide labor and materials to replace any portion of the lighting control system equipment or wiring that fails due to materials or workmanship for a period of 12 months from warranty commencement.
- B. Manufacturer's Warranty - The manufacturer shall provide a written warranty agreeing to provide parts to replace any portion of the lighting control system equipment that fails due to material or workmanship for a period of 12 months from warranty commencement.
- C. Warranty Commencement. Warranty shall begin at the point of substantial completion of the system installation which is defined as the date when commissioning and Owner training has been completed and the owner obtains beneficial use of the system.
- D. Warranty Replacement - The manufacturer shall be able to ship replacement parts within 24 hours for any component that fails due to material or workmanship during the warranty period.

PART 2 - MATERIALS

2.1 OVERVIEW

- A. The lighting control system shall consist of Low voltage lighting control panel, occupancy sensors (Dual-Technology), low-voltage switches, line-voltage switch-integrated occupancy sensors (Dual-Technology), and line-voltage switches. System designed is based on nLIGHT system, but approved manufacturer's equivalent systems are acceptable if they meet the performance criteria.

2.2 LIGHTING CONTROL PANELS

A. NX Lighting Control Panels

1. Basis of Design Product: NX Lighting Controls System, NX Lighting Control Panels.
2. As indicated and where shown on the plans, install NX Lighting Control Panels V2 (NXP2 Series).
3. Panel shall be a fully distributed intelligent lighting controller with the ability to function as a stand-alone lighting control panel or as part of an NX networked system.
4. Panel shall provide standard capacities for 8, 16, 24, 32, or 48 relays in each panel with matching number of 0-10v dimming channels.
5. Panel shall be available in custom configurations. Configuration options shall include panel shipment type (enclosure/interior shipped together, enclosure/interior shipped separately, enclosure only, and interior only), panel size, number of single pole/double pole relays, emergency control option, input voltage and enclosure mount (surface mount or flush mount).
6. Panels shall be factory assembled and tested. No field assembly shall be required.
7. Construction:
 - a. Panel shall be surface or flush wall mounted in a NEMA1 rated enclosure, based on panel configuration.
 - b. Panel shall be capable of being shipped with enclosure/interior together, enclosure/interior separately, enclosure only, and interior only in appropriately designed packaging. When enclosure is shipped separately, enclosure shall enable rough-in of all electrical connections prior to receipt of the panel interior.
 - c. Panel enclosure shall have standard electrical conduit knockouts on the top, the bottom and both sides of the enclosure to allow installation flexibility. Field drilling and cutting for pipe and wire shall not be required.
 - d. Panel shall provide keyhole mounting holes in the rear of the enclosure.
 - e. Panel enclosure shall include 6" spacing running the width of the panel at the bottom of the panel to allow for line voltage accessories such as contactors or to provide a "gutter". Space shall be separated from the low voltage area utilizing a removable metal barrier. No knockouts added to the bottom plate of the inner high voltage divider. Exterior enclosure will maintain knockouts on bottom.
 - f. Panel venting shall conform to NEMA 1 enclosure specifications to contain any local explosion and to protect the working environment.
 - g. Panel enclosure shall feature removable metal barriers that separate all high-voltage components and wiring (Class 1) from all low-voltage (Class 2) components and wiring.

- h. Panel enclosure shall be of welded construction primed and painted with a powder coat finish. Unpainted or galvanized enclosures are not acceptable.
 - i. Panel cover shall attach to the enclosure with #10-32 x ½” truss head machine screws.
 - j. Panel cover shall employ “keyhole” style openings for the top two mounting screws to allow the panel’s cover to be temporarily hung during installation eliminating the need to completely remove all the mounting screws along with contributing to safety ensuring the cover does not swing if all screws were removed.
 - 1) 8 Relay panel cover - 4 mounting holes: 2 keyhole style slots, 2 slotted style slots
 - 2) 16/32 Relay panel cover - 6 mounting holes: 2 keyhole style slots, 4 slotted style slots
 - 3) 48 Relay panel cover - 8 mounting holes: 2 keyhole style slots, 6 slotted style slots
 - k. Panel cover shall be sized for either surface or recess mounting of the panel.
 - l. Panel cover shall have hinged locking door to expose only the low voltage wiring section of the panel. Panel door hinges shall be located on the left side.
 - m. Panel shall be provided with a factory or field installable panel interior. Panel interior shall contain all controller electronics, power supplies, relays, and other required components. Panel shall arrive at the project site completely pre-wired and requiring only the connection of lighting circuits and network cable. Systems that require field assembly of controllers or chassis inserts are not acceptable
 - n. Panel interior components shall reside on a framed skeleton. When disconnected from the load circuits and necessary mounting connections, the framed skeleton can be removed taking all the electrical components intact.
 - o. Panel interior components shall be designed to not become dislodged during shipment.
 - p. Panel spacing between panel relays shall be suitable for separating any two relays in the panel to meet the NEC requirements for normal and emergency power when a metal divider is installed between relays. A metal plate barrier shall be available to separate relays - two plates per application.
 - q. Panel relays shall be of the snap-in type and be individually field replaceable.
8. Electrical:
- a. Panel shall be supplied with either a 120V/277V, 347V or 480V power supply.
 - b. Panel power supply shall provide the required capacity for the operation of the panel, relays, controllers, NX Network, SmartPORTs, user interfaces and the maximum number of low voltage and/or data devices that can be connected to each panel.
 - c. Panel wire connections shall be made to labeled terminal blocks.
 - d. Panel shall have LED status/failure indicators.
 - e. Panel shall provide support for Bluetooth programming using the NX Lighting Controls App and the NX Bluetooth Radio Bridge with Clock or a SmartPORT connected NX sensor.
 - f. Panel shall include two (2) Ethernet ports for connection to the NX Network.

- g. Panel shall include four (4) RJ45 NX SmartPORTs for the connection of all NX sensors and switches. SmartPORTs shall be capable of supplying 250 mA of Class 2 auxiliary DC power for use by wall switch stations, occupancy sensors, and daylight sensors connected to the SmartPORT connectors
- h. Panel shall have four (4) 3-wire low voltage dry contact inputs. Removable terminal blocks shall be provided to support momentary or maintained closures from building automation systems, fire systems, demand response and security systems as well as other systems or devices including occupancy sensors, daylight sensors, and low voltage switches. Each input shall be individually programmable and provide the ability to initiate any NX switch compatible function or command. (on, off, raise, lower, preset, timed on/off). Each input will provide a connection for sourcing 24V, a common, control and pilot light functionality for low voltage switch stations.
- i. Panel shall have two (2) SPDT (NO/NC) dry contact outputs, with removable terminal blocks, to provide a contact closure to signal out to another system that is capable of receiving a NO or NC closure to signal building automation, security or alarm system based on a schedule or a command from an input device (e.g. occupancy sensor, daylight sensor, wall switch station, etc.). Each output will have a contact rating of 24VDC@50mA minimum.
- j. Panel shall have an easily accessible, removable coin size battery for maintaining system time during a power loss.
- k. Panel shall, after a power loss, retain time for a minimum of 72 hours.
- l. Panel time shall be updated when connected to a device utilizing the NX Lighting Controls App or from an NX network time server.
- m. Panel shall feature a power sensing circuit and transformer for UL924 operation. Upon detection of loss of power, the panel shall force all relays closed and all dimming channels to full bright. Panel shall maintain this state until normal power is restored. Connected devices will not be powered.
- n. Panel shall have a test button on the optional UL924 board to test the UL924 operation.
- o. Panel shall have a low voltage remote test switch input on the optional UL924 to test the UL924 operation.
- p. Panel shall provide relay/dimmer boards to expand panel capacity from 8 to 48 relay outputs in groups of 8. Relay/dimmer boards shall be completely self-configuring and shall not require manual settings to configure for use within the panel.
- q. Panel relay/dimmer boards shall confirm relay presence and status.
- r. Panel relay/dimmer boards shall have (8) 0-10V integrated dimming channels, each capable of sinking 50mA.
- s. Panel dimming channels shall be software assignable.
- t. Panel shall be capable of containing 1 to 48 robust and reliable mechanically latching lighting control relays as indicated on the drawings and schedules as specified herein. Electrically held or non-mechanically latching relays shall not be considered.
- u. Panel relays shall be individually UL and CUL listed and shall bear labels indicating compliance. Lighting control relays shall be tested to UL standard 508 for both safety and endurances and bare labels signifying compliance.
- v. Panel relays shall have the following load ratings:
 - 1) Single Pole Relays:

- a) General Use: 30A @ 300VAC
 - b) Tungsten: 2400W @ 120VAC
 - c) Standard Ballast: 20A @ 300VAC
 - d) Motor Starting: 1HP @ 110-125VAC; 1½ HP @ 220-277VAC
- 2) Double Pole Relays:
- a) General Use: 20A @ 480VAC
 - b) Tungsten: 2400W @ 120VAC
 - c) Standard Ballast: 20A @ 480VAC
 - d) Motor Starting: 1HP @ 110-125VAC; 1½ HP at 220-277VAC
- w. Panel relays shall be rated for minimum cycle life of 120,000+ operations (60,000+ cycles).
- x. Panel relays shall have a Short Circuit Current Rating (SCCR) of 18,000A @ 277VAC.
- y. Panel relays shall have a built-in manual override lever & ON/OFF indicator.
- z. Panel relays shall be capable of manual activation On or Off with or without power.
9. Functional:
- a. Panel shall be of the distributed intelligence type and shall not be dependent on a network connection to execute schedules or perform programmed functions.
 - b. Panel shall be programmed using the optional NXBTC Bluetooth® radio module with clock and NX Lighting Controls App. When networked, panel configurations shall be performed utilizing the NX Area Controller's web-browser based Graphical User Interface.
 - c. Panel shall provide the ability to update panel firmware. Firmware update process shall ensure that the complete and correct firmware (e.g. via CRC check) has been downloaded before the panel is flashed with the new firmware.
 - d. Panel set up and configuration functions shall include (but are not limited to):
 - 1) Assign/reassign relays for control by wall switch station buttons,
 - 2) Configure relays for occupancy or vacancy operation,
 - 3) Assign/reassign dimmers to raise/lower switches,
 - 4) Assign dimming channels for response to daylight sensor control,
 - 5) Assign names to relays/dimmers,
 - 6) Auto calibrate default daylight sensor sequence of operation,
 - 7) Create and save preset scenes,
 - 8) Configure wall switch button types. At a minimum, button types shall include toggle on/off with pilot, preset, on only and off only,
 - 9) Configure up to six zones of daylight harvesting per room with independent set points and time delays,
 - 10) Include or exclude loads from occupancy sensor control,
 - 11) Configure up to 16 load groups per zone,
 - 12) Configure up to 16 preset scenes per zone with independent fade times,
 - 13) Set independent power up conditions for relays and dimmers,
 - 14) Set independent occupied and unoccupied conditions for each relay and dimmer,
 - 15) Adjust dimmer high and low trim points,
 - 16) Manually control lighting loads

- e. Panel shall provide the ability to create up to ninety-nine (99) schedules per zone. Each schedule will consist of the following:
 - 1) Event Time – Shall be configured as a specific set “Normal” time (hh:mm am/pm) or as an offset based on one of the following: Before Sunrise, After Sunrise, Before Sunset, After Sunset, Before Open, After Open, Before Close or After Close.
 - 2) Action – Task to be performed: None, Group State, or activation of a Preset.
 - 3) None – No action to perform
 - 4) Group State – The specific relay / dim level / color temp range settings, that the select group(s) of actuators should implement.
 - 5) Presets – The specific preset that should be activated.
- f. Panel shall provide the ability to disable a schedule
- g. Panel shall provide the ability to delete a schedule

2.3 CONTROL SWITCHES AND SENSORS

A. Dual Technology Wall-Switch Sensors:

- 1. Self-adjusting ultrasonic and passive infrared sensitivity
- 2. Automatic false-on/ false-off corrections
- 3. For accuracy and consistency, sensor shall have a switch controlled, digital time delay, adjustable from 4 minutes to 30 minutes.
- 4. 40kHz ultrasonic output
- 5. Sensor shall utilize a temperature compensated dual element sensor and a multi-element Fresnel lens.
- 6. Sensor shall cover 180°, up to 1000 square feet of motion.
- 7. Electrical Ratings: 120VAC: 800W electronic ballast/ LED driver
- 8. Impact-resistant lens
- 9. Sensor shall be UL and CUL listed.
- 10. Manufacturers: Acuity nLIGHT, Hubbell, Watt Stopper, Sensor Switch, Leviton, Eaton, or approved equal.

B. Dual Technology Occupancy Sensor with Daylight Harvesting Photo-Cell:

- 1. Self-adjusting ultrasonic and passive infrared sensitivity
- 2. Automatic false-on/ false-off corrections
- 3. For accuracy and consistency, sensor shall have a switch controlled, digital time delay, adjustable from 4 minutes to 30 minutes.
- 4. 40kHz ultrasonic output
- 5. Sensor shall utilize a temperature compensated dual element sensor and a multi-element Fresnel lens.
- 6. Sensor shall cover 360°.
- 7. Shall be internally factory mounted to light fixture.
- 8. Communicates with Room controller/power pack with RJ-45 connectivity.
- 9. The sensor shall be a device that detects occupancy and dims and/or turn on or off electrical lighting in response.
- 10. The sensor shall detect light levels and dim lighting proportionally to the amount of daylight in the area.
- 11. The light level sensor shall be a low voltage device, powered by the DC voltage supplied by the RS-45 port on room controller/power pack.
- 12. The light level sensor shall utilize an internal photo sensor with a spectral filtering system to measure daylight and electrical light levels within a given space.
- 13. The light level sensor shall utilize a Fresnel lens system, which allows the sensor to measure light levels uniformly across a 60° field of view.
- 14. The sensor shall have a control range of 20-200 footcandles.

15. The sensor shall have a standard five year warranty.
16. Sensor shall be UL and CUL listed.
17. Manufacturers: Acuity nLIGHT, Watt Stopper, Sensor Switch, Leviton, Eaton, or approved equal.

C. Low voltage wall switches

1. Communicates with room controller/power pack with RJ-45 connectivity.
2. On/off lighting control functionality
3. Where dimming models are indicated on plan, provide with on/off/raise/lower control functionality.
4. Shall have a standard five year warranty.
5. Shall be UL and CUL listed.
6. Manufacturers: Acuity nLIGHT, Watt Stopper, Sensor Switch, Leviton, Eaton, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install the lighting control equipment according to the manufacturers written instructions. Contractor shall make all necessary wiring connections to external devices and equipment.

3.2 CONTROL WIRING INSTALLATION

- A. Provide and install all wiring between control devices as indicated in the contract drawings, details, and/or indicated in the manufacturer's submittal package.
- B. All low voltage control wiring shall be run in metallic conduit as shown on the drawings.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services - Arrange and pay for the services of factory authorized service representatives to commission, test and program the lighting control system.

3.4 CLEANING

- A. The contractor shall remove all paint spatters and other spots, dirt and debris from the equipment. Clean equipment and devices internally and externally using methods and materials recommended by the manufacturer.

3.5 COORDINATION

- A. It shall be the responsibility of the installing contractor to receive and store materials and equipment necessary to his work. It is intended that specifications and plans shall include everything required and necessary for proper and complete installation of the lighting control system even though not every item may be particularly mentioned in detail.
- B. The electrical contractor shall timely deliver to other trades any equipment that must be installed during construction.
- C. Electrical contractor shall be responsible for field measurements and coordination of the physical size of all equipment with the architectural requirements of the spaces into which the equipment will be installed.

3.6 COMMISSIONING

- A. Accurate record drawings shall be furnished by the Contractor to aid the Owner in programming. These should indicate the load controlled by each device and identify the physical location of each power pack.
 - 1. Provide all work for a complete system, including complete system testing and checkouts. All components shall be properly mounted and wired according to manufacturer's specifications and instructions.
- B. Verify lighting control components are operating as intended.
- C. Sequence of Operation: See lighting control scheme on drawings.
- D. Set time delay and sensitivity for all occupancy sensors in accordance with manufacturer's written instructions based on room type.
- E. Adjust settings as required for all photo sensors for systems to function properly and to maximize system performance.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 DESCRIPTION:

- A. Work of this section includes main distribution, lighting, and branch panelboards.

1.3 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Shop drawings.
- C. Product Data:
 - 1. Panelboards
 - 2. Circuit breakers
 - 3. Drawings and schedules

PART 2 - PRODUCTS

2.1 PANELBOARDS

- A. Provide UL listed and labeled, dead front type with box of not less than 14 gauge galvanized steel. The front plate and door shall be of 12 gauge steel.
- B. Provide panelboard NEMA surface mounted complete with panel trim having concealed hinges and trim mounting screws, locking door with flush catch.
- C. Single box with common front painted to match trim. Provide ample wiring gutter in accordance with National Electrical Code.
- D. Units shall be UL listed as suitable for service entrance where required.
- E. Panelboard shall be unassembled with gray baked enamel finish.
- F. 120/240 Volt single phase, 3 wire, solid neutral design with sequence style bussing and full capacity neutral, composed of an assembly of bolt-in-place molded case automatic air circuit breakers with thermal and magnetic trip and trip free position separate from either "ON" or "OFF" positions. Provide interrupting rating as noted on the drawings, 22,000 AIC minimum.
- G. Main bus to be tin plated aluminum rectangular in cross section and of full length.
- H. Each panelboard shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one (1) conductor shall be installed per lug.

- I. Provide integral control contactors for split bus systems. Contactors shall be UL listed for use in panelboard. Refer to the drawings for contactor specifications.
- J. The panelboards shall be manufactured by Eaton, Square-D, GE, or Siemens.

2.2 GENERAL

- A. Ground fault interrupting type circuit breaker shall be provided on circuits where receptacles are outdoors or in wet locations.
- B. Minimum circuit breaker trip rating shall be 15 amps for power and lighting as shown on panel schedules.
- C. Provide locking devices on circuit breakers as shown on panel schedules, two minimum per panel.
- D. Provide a minimum of 10% spare breakers (minimum of 2) installed in each panel or as noted in schedule, whichever quantity is greater. Spare breakers shall be sized to match the size most utilized in the project.
- E. Panelboard schedules are shown on the drawings.
- F. Provide mounting brackets, busbar drillings, and filler pieces for unused spaces.
- G. Provide a minimum of 20% spare branch circuit breaker space for future.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Ground the power panel to the main ground system for the building electrical system.
- B. All wiring terminations to be marked as to wire number or circuit number.
- C. Prepare and affix typewritten directory to inside cover of panelboards indicating loads controlled by each circuit. Existing panelboards where circuits have been added or modified shall have circuit directory updated. Where changes are significant and cannot neatly and concisely be indicated on existing circuit directory, a new directory shall be provided with existing and new/updated circuits identified.
- D. Panelboards to be mounted on wall square with building lines.

3.2 VISUAL AND MECHANICAL INSPECTION

- A. Verify appropriate anchorage, required area clearances, physical damage, and correct alignment and cleanliness.
- B. Inspect all doors, panels, and sections for paint, dents, scratches, fit, and missing hardware.
- C. Verify circuit breaker sizes and types correspond to drawings and schedules.
- D. Inspect insulators for evidence of physical damage or contaminated surfaces.

- E. Verify the barriers and shutters are installed and operating correctly.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 SECTION INCLUDES

- A. Wiring devices including but not limited to receptacles, power receptacles, light switches, wall plates, cover plates, GFIC receptacles, pushbuttons, thermostats, and selector switches.
- B. Devices for all locations and applications may not be specifically identified below. All devices provided shall be appropriate for the area, and the function where they will be utilized. Devices provided shall meet all applicable code requirements, whether called for by the documents or not. Where devices are readily available for the area and function of use and the appropriate device is not specified, the appropriate device shall be provided. Coordinate the devices required with the Engineer during construction.

1.3 RELATED SECTIONS

- A. Section 26 05 34 - Electrical Boxes.

1.4 SUBMITTALS

- A. Submit under provision of Division 1.
- B. Product data of all types of items supplied.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Wiring devices shall be appropriate and rated for areas of installation.

2.2 WALL SWITCHES

- A. 120/277 Volt Switches (not interfaced with other specialty system): Premium Industrial Specification grade, toggle handle, with totally enclosed case, rated 20 ampere, tungsten, 60 Hertz. Switches to be Hubbell #1221 or equal by Leviton, Cooper Wiring, or GE. Provide matching 2 pole, 3 way and 4 way switches.
- B. Switch and Pilot Light: Toggle action type with red handle, integral long-life neon pilot light, rated at 20 ampere, 120 volts.
- C. Color: Coordinate with Architect.

2.3 RECEPTACLES

- A. Standard duplex receptacles shall be heavy duty specification grade, full gang size, polarized, duplex, parallel blades, grounding type, rated at 20 amperes, 120V conforming to NEMA (5-20R). Receptacles shall be Hubbell 5362BKWR or equal by Leviton or GE.
- B. Standard single receptacle shall be specification grade, full gang size polarized, parallel blades, grounding type, rated at 2-pole, 3 wire 20 ampere, 240V conforming to NEMA (6-20R). Receptacles shall be Hubbell 5361BK or equal by Leviton, Cooper.
- C. Ground fault receptacle shall be UL listed Class A with 5 milli-ampere sensitivity 20 ampere, 120 VAC, grounded, NEMA 5-20R with conformal coated circuit board. Receptacle shall have test and reset buttons integral with receptacle. Receptacles shall be Hubbell Circuit Guard Industrial GFCI Receptacles GFR5362 or equal by Leviton or GE.
- D. Weatherproof/weather resistant receptacles shall have cast metal weatherproof covers that allow for complete coverage of receptacle during use.
- E. Color: Brown - Indoor.

2.4 COVER PLATES

- A. Provide for standard switches and receptacles for main level areas unless noted otherwise. Cover plates to be brushed stainless steel 302.
- B. Provide weatherproof rated gray switch coverplates for light switches located outdoors. Plate type based on a Hubbell HBL1795 or equal.
- C. Provide weatherproof rated gray receptacle coverplates for receptacles located outdoors. Plate type based on a Hubbell Taymac MX3200 or equal.

2.5 FUSED SWITCHES

- A. Fused switch unit shall be for 120VAC, single phase fans associated with unit heaters, cabinet heaters, etc.
- B. Switch shall be integral with a standard two-gang stamp steel junction box cover with integral fuse holder and fuse cover. Switch shall be rated for 120VAC, 15A. Switch unit type shall be Bussmann type SSY or approved equal.

2.6 PUSHBUTTON AND SELECTOR SWITCHES

- A. Pushbuttons and selector switch operators shall be compatible for nominal 30 mm mounting holes in the control panel and pushbutton stations. Operators shall be one complete assembly including the pushbutton or selector switch, contact blocks, and nameplate. The operators shall be black unless noted otherwise in the specifications or drawings. Contact blocks shall be provided as required for proper control and operation.
- B. Contact blocks shall have a continuous current rating of 10 amps.
- C. Pushbutton operators shall be configured for momentary or maintained operation depending on the control function required per the specifications and drawings. Pushbuttons shall be non-illuminated and flush with the button housing.

- D. Selector switch operators shall be configured as 2-position or 3-position maintained or momentary (spring return to a select position) depending on the control function required per the specifications and drawings. Selector switch shall have a standard knob handle that does extend beyond the edge of the switch housing. Knob handle shall clearly indicate position of switch.
- E. Operators for panels and enclosures in general indoor locations shall be watertight and oil resistant, rated NEMA 4/13. For corrosive environments (chemical storage rooms, etc.) operators shall be rated NEMA 4X. Operator design based on Allen-Bradley Bulletin 800T or equal by Square D, Eaton, and Adalet.

2.7 CONTROL RELAYS

- A. Control and Auxiliary Relays: Provide plastic enclosed plug-in with contacts rated not less than 10 amperes at 120VAC contact arrangement to be double pole or three pole, as required, double throw. Plug-in sockets to be 8-pin or 11-pin tube type with screw terminals for mounting on DIN rail or backplates. Acceptable manufacturers are Allen-Bradley, Square D, Potter Brumfield, or Idec.
- B. Provide industrial control relays four poles or more with interchangeable reversible cartridge type N.O.-N.C. contacts and the contacts shall be rated 10 amperes at 120V AC and shall have a continuous duty coil. Provide relay-mounting straps for grouped mounted relays. The relays shall be Allen-Bradley, Bulletin 700P, Square D, Class 8501, Type X, or General Electric.
- C. Time Delay Control Relays: The time delay control relays for "on" delay or "off" delay circuits plug-in type shall be of double pole double throw plastic enclosed. Contacts shall be rated not less than 10 amperes at 120VAC and continuous duty timing circuit and coil. Relays shall have calibrated dial and knob adjustment with time range as required. The relays shall be manufactured by Allen-Bradley, Square D, Potter-Brumfield, Magnecraft, or other approved equal.

2.8 INDICATION PILOT LIGHTS

- A. Indication pilot lights shall be compatible for nominal 30mm mounting holes in the control panel. Pilot lights shall be a steady on LED push-to-test style light that operates at full voltage on 120VAC or 24V AC/DC power. Provide plastic color lens for indicating pilot light per requirements of the drawings and specifications.
- B. Indication pilot lights for outdoor locations shall be watertight and oil resistant, rated NEMA 4/13. Pilot light design based on Allen-Bradley Bulletin 800T or equal by Square D, Eaton, and Adalet.
- C. Indication pilot lights for panels and enclosures in outdoor and general indoor locations shall be watertight and oil resistant, rated NEMA 4/13. For corrosive environments (chemical storage rooms, etc.) operators shall be rated NEMA 4X. Pilot light design based on Allen-Bradley Bulletin 800T or equal by Square D, Eaton, and Adalet.

2.9 LINE VOLTAGE THERMOSTATS

- A. Unless noted otherwise, thermostats controlling heaters and cooling fans shall be heavy duty line voltage rated 16 amps at 120V for pilot duty sized for the contactor coil load, adjustable range 45° to 85°F with adjustable dead band range of 0-3°. Single pole, double throw suitable for operating heating or cooling loads.

- B. The thermostats for normal indoor locations shall be NEMA 4X rated, Chromalox Model WCRT-100 or equal by Honeywell. The thermostats for hazardous environments (i.e., XP rooms) shall be Chromalox type WR80-EP or equal by Honeywell.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mount wall switches 42 inches to bottom above finished floor, as indicated, or otherwise required by application.
- B. Mount line voltage thermostats 60" to bottom above the finished floor.
- C. Coordinate switch-mounting location with architectural detail.
- D. Mount receptacles 42" to bottom above finished floor or as noted on the drawings.
- E. Install cover plates on all wiring devices.
- F. The outdoor units to be enclosed in cast aluminum boxes with cast aluminum, weatherproof cover plates. Receptacles shall have "while-in-use" covers.
- G. Where more than one wall switch is installed in the same location, set under one cover plate.
- H. Provide permanent barriers between adjacent switches on 240-volt service.
- I. Install in accordance with drawings, submittals, and manufacturer's recommendations.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 DESCRIPTION

- A. Work of this section includes fuses and fuse holders.

1.3 SUBMITTALS

- A. Submit under provision of Division 1.
- B. Product data.
- C. Time current curves and current limitation curves for fuses when needed for coordination.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All fuses shall be UL listed, current limiting type with high interrupting capacity.
- B. All fuse contact surfaces shall be plated.
- C. Fuses shall be selected to provide a fully selective system.
- D. Coordinate fuse type with fuse holder.

2.2 MANUFACTURERS

- A. Fuses shall be Littelfuse, Mersen, or Bussmann.

2.3 TRANSFORMER PROTECTION FUSES

- A. Low Voltage (600 VAC or less):
 - 1. Above 600A: Provide Class L fuses for low voltage transformers rated above 600A.
 - 2. 600A or less: Provide Class RK5, time delay type fuses for low voltage transformers rated 600A or less.
 - 3. All fuses shall have 200,000 amperes RMS interrupting rating.
- B. Control Circuit (600 VAC or less): Provide Class CC for control circuit transformers rated 600 VAC or less. Fuses shall have 200,000 amperes RMS interrupting rating.

2.4 MOTOR PROTECTION FUSES

- A. Low Voltage (600 VAC or less): Provide time delay type, Class RK-5 (if more current limitation is required, provide Class RK-1 or Class J) fuses for short circuit protection of low

voltage motors and motor controllers. Fuses shall have 200,000 amperes RMS interrupting rating.

2.5 MAIN, FEEDER, AND BRANCH CIRCUIT FUSES

- A. Circuits 0 through 600 amps shall be protected by current-limiting, dual-element, time-delay fuses. All fuses shall have separate overload and short circuit elements. Fuses shall incorporate a spring activated thermal overload. The fuses shall hold 500% of rated current for a minimum of 10 seconds (30A, 250V Class RK1 case size may be a minimum of 8 seconds at 500% of rated current) with an interrupting rating of 200,000 amps RMS symmetrical, and be listed by a nationally recognized testing laboratory. Peak let-through currents and I²t let-through energies shall not exceed the values established for Class RK1, CF or J fuses.
- B. Circuits 601 through 6000 amps shall be protected by current-limiting, time-delay fuses. Fuses shall be time-delay and shall hold 500% of rated current for a minimum of 4 seconds, clear 20 times rated current in .01 seconds or less, with an interrupting rating of 200,000 amps RMS symmetrical, and be listed by a nationally recognized testing laboratory. Peak let-through currents and I²t let-through energies shall not exceed the values established for Class L fuses.

2.6 FUSE HOLDERS

- A. Wire connectors shall be box type - most durable and versatile, for stranded or solid wire.
- B. Fuse block insulators shall be molded polycarbonate type. All insulators shall meet voltage clearance and creepage requirements of UL for general industrial control equipment.
- C. Fuse clips shall be standard clips - cover all ratings 30-600 amperes spring reinforced with rejection feature for Class R fuses.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fuses to be properly mounted or bolted into their fuseholder so as to maintain proper continuity.
- B. Fuses and fuseholders shall be sized according to the NEC.
- C. Coordination with other protective devices shall be accomplished by using proper time-current curves.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 DESCRIPTION

- A. Work of this section includes motor and general circuit disconnects including separately mounted disconnects.

1.3 RELATED SECTIONS

- A. Section 26 28 13 - Fuses.

1.4 SUBMITTALS

- A. Submit under provision of Section 26 05 00 and Division 1.
- B. Provide shop drawings and product data for disconnects including outline and mounting dimensions, wiring schematic diagrams, and short circuit current withstand ability ratings.
- C. Provide operational and maintenance data including renewal parts for all disconnects.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

- A. Provide disconnect switches with switch blades fully visible in "OFF" position, rated NEMA type HD, UL listed, with quick-make, quick-break operation handle, and mechanism forming an integral part of the box, not in the cover. All current carrying parts shall be plated to resist corrosion and have cool operation. The switches to have dual cover interlock to prevent unauthorized opening of door in the "ON" position or closing switch with door open. Provide padlocking provisions to allow at least three (3) padlocks to prevent switch operation in the "OFF" position. Provide safety switches, fused, non-fused to horsepower rated, as required.
- B. General purpose switches shall have NEMA 1(indoor) or NEMA 3R rainproof (outdoor) enclosure. Enclosure, covers to be securable in open position. The disconnect switch type enclosures shall be made of the following steel: NEMA 1 - Code gauge (UL 90) sheet steel, NEMA 3R - Code gauge (UL 98) galvanized steel. All enclosures to be given a rust-inhibitive phosphate treatment and then a coat of baked-on-gray enamel.
- C. Provide fusible disconnect switches with clips for fuses which have UL listed short circuit rating of 200,000 rms symmetrical amperes when Class R or Class J fuses are used.
- D. In outdoor or wet locations areas the disconnect switch enclosures and operators shall be of non-metallic corrosion resistant with stainless steel hardware and be gasketed to protect the exterior mechanisms. Switches shall be NEMA 4X rated.

- E. Disconnect switches shall be provided with mechanical type lugs suitable for the conductors used.
- F. Service entrance safety switch shall be a fusible single-throw safety switch with the following features:
 - 1. UL listed as suitable for use as service entrance equipment.
 - 2. Have a UL listed short circuit rating of 200 kA with R, J, or T fuses.
 - 3. Three-phase with neutral assembly included.
- G. Acceptable Manufacturers:
 - 1. Eaton, Square D, Siemens, GE or Allen-Bradley.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install motor and circuit disconnects in accordance with manufacturers recommendations and applicable codes.
- B. Provide fuses of required rating in each fused switch.
- C. Inspect all disconnect devices for damage. Verify operation of the disconnect switch prior to energizing or adding load.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 DESCRIPTION

- B. Work of this section includes circuit breakers and their related enclosures.

1.3 RELATED SECTIONS

- A. Section 26 24 16 - Panelboards.

1.4 SUBMITTALS

- A. Submit under provision of Division 1.
- B. Product data including applicable shop drawings.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide required circuit breakers for installation in panelboards, switchboards, individual enclosures, or motor control centers. Circuit breaker manufacturer shall be that of the equipment in which it is installed or shall be supplied by that equipment manufacturer.
- B. Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the drawings and schedules.
- C. Provide electronic trip circuit breakers where indicated on the drawings.
- D. All breakers shall be rated for the applied voltage and have a minimum 10,000-amp interrupt rating.

2.2 MOLDED CASE CIRCUIT BREAKERS

- A. General: Provide enclosed, molded-case circuit breaker conforming to NEMA AB 1, suitable for use as service entrance equipment where so applied. Switches used as service equipment are to be labeled for this application. Provide solid neutral assembly and equipment ground bar.
- B. Protective devices shall be molded case circuit breakers with inverse time and instantaneous tripping characteristics.
- C. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be non-welding silver alloy and arc extinction shall be accomplished by means of DE-ION arc

chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.

- D. Thermal Magnetic Trip Type Breakers:
1. Each circuit breaker shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole.
 2. Circuit breakers with frame sizes greater than 100 amperes shall have variable magnetic trip elements which are set by a single adjustment (to ensure uniform tripping characteristics in each pole).
 3. Single pole 15 and 20 ampere breakers shall be SWD rated.
 4. Unless noted otherwise, ground fault current interrupters (GFCI) shall have 4-6 mA sensitivity. GFCI circuit breakers shall have a test button to facilitate testing.
 5. Where specified, ground-fault protection for equipment (GFPE), breakers shall have a ground fault current interrupting function. GFPE circuit breakers shall have a test button to facilitate testing. GFPE circuit breakers shall be marked with their trip threshold in milliamperes in a location accessible without removing trims or covers. Trip threshold between 30 and 50 milliamps.
- E. Solid-State Circuit Breakers: Enclosed circuit breakers 1000 ampere frame and above shall be equipped with solid-state programmable trip complete with built-in current transformers, solid-state trip unit, and flux transfer shunt trip. The solid-state electronic programmable trip device shall have the following features and tripping functions.
1. Adjustable current setting.
 2. Adjustable long-time delay.
 3. Adjustable instantaneous pick-up.
 4. Adjustable short time delay.
 5. Adjustable short time pick-up
- F. Ground fault protection shall be provided where indicated.
- G. Options Available for Circuit Breakers:
1. Line and load lugs suitable for use with copper conductors with standard copper pressure, set screw fastening, aluminum alloy terminals.
 2. Mechanical interlocking of walking beam or sliding bar type.
 3. Enclosure of NEMA 12 Type or as required by application.
 4. External/front mounted operator with cable operating mechanism as required.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Circuit breakers to be mounted in enclosures, panels, load centers, motor control centers, or switchgear.
- B. Enclosure for circuit breaker shall be properly grounded.
- C. Attach handles so as to not interfere with cover plate or door.
- D. Properly mount circuit breaker so acceptable electrical connection is made to bus work.
- E. Terminations to breaker terminals shall be to industry standards.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 RELATED DOCUMENTS

- A. Provide surge protection devices as depicted and described in the contract documents.

1.3 DESCRIPTION

- A. General: Surge protection device (SPD) is the description and equipment required for the protection of all AC electrical circuits and electronic equipment from the effects of lightning induced voltages, external switching transients and internally generated switching transients.

1.4 REFERENCE STANDARDS AND PUBLICATIONS

- A. General: The latest edition of the following standards and publications shall comply to the work of this section:
 1. ANSI/IEEE C84.1-1989, American National Standard for Electric Power Systems and Equipment - Voltage Ratings (60 Hertz)
 2. ANSI/IEEE C62.41-1991, Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits
 3. ANSI/IEEE C62.45-1992, IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits
 4. Underwriters Laboratories UL 1449 Third Edition, Standard for Safety - Transient Voltage Surge Suppressors
 5. Underwriters Laboratories, UL 1283, Standard for Safety - Electromagnetic Interference Filters
 6. National Fire Protection Association, NFPA 780 - National Electrical Code
 7. IEEE Standard 142-1991, IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems (IEEE Green Book)
 8. ANSI/IEEE Standard 141-1999, IEEE Recommended Practice for Electric Power Distribution for Industrial Plants (IEEE Red Book)
 9. IEEE Standard 1100-1999, IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment (IEEE Emerald Book)
 10. FIPS Pub 94, Federal Information Processing Standards Publication - Guideline on Electrical Power for ADP Installations
 11. National Electrical Manufacturer's Association LS-1, 1992 (NEMA LS-1)
 12. MIL Standard 220A Method of Insertion-loss Measurement
 13. ISO 9001:1994, Quality Systems - Model for Quality Assurance in Design, Development, Production, Installation and Servicing

1.5 QUALITY ASSURANCE

- A. The manufacturer shall submit a written statement indicating that a factory authorized representative inspected the installation. The installing contractor shall submit a checkout memorandum to the manufacturer. The memorandum shall indicate the date the

equipment is placed into service and the actual method of installation. Submit three copies to the specifying engineer.

- B. The manufacturer must be regularly engaged in the manufacture of surge suppression products for the specified categories for no less than ten (10) years.

1.6 WARRANTY

- A. The SPD and supporting components shall be guaranteed by the manufacturer to be free of defects in material and workmanship for a minimum period of ten (10) years from the date of substantial completion of service and activation of the system to which the suppressor is attached.
- B. Warranty is to cover the effects of lightning, single phasing, and all other electrical anomalies. The warranty shall cover the entire device, not just various components, such as modules only.
- C. The installation of SPDs in or on electrical distribution equipment shall in no way compromise the equipment listing, labeling, or warranty of the distribution equipment.

1.7 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. The transient voltage surge suppression submittals shall include, but shall not be limited to, the following information:
 - 1. Data for each suppressor type indicating conductor sizes, conductor types, and connection configuration and lead lengths.
 - 2. Manufacturer's certified test data indicating the ability of the product to meet or exceed requirements of this specification.
 - 3. Drawings, with dimensions, indicating SPD mounting arrangement and lead length configuration, and mounting arrangement of any optional remote diagnostic equipment and assemblies.
 - 4. List and detail all protection systems such as fuses, disconnecting means and protective materials.
 - 5. SPD wiring, bonding, and grounding connections shall be indicated on the wiring diagrams for each system. Include installation details demonstrating mechanical and electrical connections to equipment to be protected.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Surge Protection Devices shall be a Total Power Solutions ServiceTrack ST Series device, approved equal by Eaton, Square-D, or engineered approved equal. Manufacturers requesting product approval must meet the written specification contained herein.

2.2 GENERAL REQUIREMENTS

- A. SPDs shall be listed in accordance with UL 1449 3rd Edition, Type 1 for Type 1 and Type 2 locations and UL 1283, Standard for Safety, Electromagnetic Interference Filters.

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SURGE PROTECTION DEVICES

- B. The SPD shall protect all modes and there shall be five discrete suppression circuits: 2 modes connected Line to Ground, 2 modes connected Line to Neutral, and 1 mode connected Neutral to Ground for a 1-phase, 3-wire, plus ground voltage system. Line to Neutral to Ground is not an acceptable substitute for Line to Ground. Line to Neutral to Line and Line to Ground to Line (in combination) will be acceptable for Line to Line protection.
- C. All SPDs must have passed the UL 1449 3rd Edition Fault Current Test with a Rating of 200,000 AIC. Documentation substantiating this claim must be provided.
- D. SPDs shall use a separate path to building ground; the equipment safety ground is not to be used as a transient ground path.
- E. All SPDs are to be MOV based and not included SAD technology as a means of suppression.
- F. The maximum continuous operating voltage (MCOV) of all components shall not be less than 125% for a 120V system and 115% for 220, 240, 277, and 480V systems.
- G. Standard diagnostic features are to include green LEDs (one per phase - normally on) indicating power and suppression status and a form C dry relay contact.
- H. Extended diagnostics must include an audible alarm and surge counter to be displayed on an LCD display on the front of the suppressor. The surge counter must include a reset option. The audible alarm must include a mute option. Products requiring diagnostic test kits will not be acceptable.
- I. SPDs shall be of compact design. The mounting position of the SPD shall allow a straight and short lead-length connection between the SPD and the point of connection in the panelboard.
- J. Visual indication of proper SPD connection and operation shall be easily viewed on the front panel of the enclosure. The indicator lights shall indicate suppression circuit status, phase status, phase loss, reduced protection level and suppression fault.
- K. The SPD shall be equipped with an integral disconnect switch.
- L. A set of normally open/normally closed Form C dry contacts shall be provided for remote monitoring.
- M. The enclosure type shall have a minimum of a NEMA 12 rating.
- N. SPDs shall be equipped with an audible alarm with mute, reset and acknowledge features.
- O. The device must be certified (report to be submitted) to withstand a minimum of 20,000 Category C3 (Combination wave - 20,000 Volts - 1.2x50 :s OCV and 10,000 Amps - 8x20 :s SCC as defined by ANSI/IEEE C62.41-1991) impulses with less than 10% change in the baseline to final let-through voltage. This data must be submitted as an independently verified and certified test report.
- P. Unit shall have component level fusing integral to the SPD for over current protection (OCP).

2.3 PROTECTION REQUIREMENTS

- A. SPD shall provide protection for all modes of protection (L-L, L-N, L-G & N-G).
- B. Response time of SPD to a surge shall be less than one nanosecond.
- C. Maximum rated surge current: 160 kA per phase / 80 kA per mode.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Provide wiring as recommended by manufacturer between surge protective device and connected distribution equipment. Wiring shall be installed in conduit. Phase, neutral, and ground connection leads shall be kept as short as possible.
- B. The contractor shall follow the SPD manufacturer's recommended installation practice as found in the equipment installation instructions.
- C. The installation shall meet the requirements of all applicable codes.

END OF SECTION

PART 1- GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section. If differing requirements are identified elsewhere (in these specifications or on drawings or separate instructions), the more stringent requirement shall be met.

1.2 DESCRIPTION

- A. The work of this section includes interior, exterior, emergency lighting, and site lighting.

1.3 SUBMITTALS

- A. Submit under provision of Division 1.
- B. Provide product data for lighting units including outline and mounting dimensions, performance data, lighting efficiency tables, and graphic representation of photometric light distribution for each fixture or lighting unit.
- C. Submit manufacturer's cut sheets for roadway lighting poles and luminaires.

1.4 WARRANTY

- A. All light fixtures or lighting units shall be fully warranted against defective workmanship and materials for a period of one year from date of substantial completion.

1.5 QUALITY ASSURANCE

- A. Provide only LED fixtures with a Design Lights Consortium (DLC) listing, a U.S. Department of Energy (DOE) "LED Lighting Facts" label, or a U.S. Environmental Protection Agency (EPA) ENERGY STAR label, which have demonstrated third-party testing verification.
- B. Electrical Component Standard: Components and installation shall comply with NFPA 70 National Electrical Code.
- C. UL Compliance: Emergency lighting fixtures shall be UL listed and labeled.
- D. Local Code Compliance: Comply with applicable local codes and regulations for emergency lighting and exit signage including, but not limited to, colors and letter heights for exit signs.
- E. UL Standard 8750 "Light Emitting Diode Equipment for Use in Lighting Products", IES Standard LM-79 "Electrical and Photometric Measurements of Solid-State Lighting Products", IES Standard LM-80 "Measuring Lumen Maintenance of LED Light Sources", and IES Standard TM-21 "Projecting Long Term Lumen Maintenance of LED Light Sources".
- F. ANSI C78.377 "Specifications for the Chromaticity of Solid State Lighting Products" with LEDs binned within a maximum three-step MacAdam Ellipse to ensure color consistency amongst luminaires of the same type.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers: (and as listed in the fixture schedule.)
1. Lithonia.
 2. Columbia.
 3. Eaton.
 4. Or approved equal.

2.2 INTERIOR AND EXTERIOR BUILDING LIGHTING

- A. General:
1. Interior and exterior building lighting units shall have UL approval and label.
 2. Fixtures shall be Design Lights Consortium (DLC) approved.
- B. LED Light Fixtures:
1. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.
 2. LED light fixtures shall be Reduction of Hazardous Substances (RoHS)-compliant.
 3. LED drivers shall include the following features unless otherwise indicated:
 - a. Minimum efficiency: 85% at full load.
 - b. Minimum Operating Ambient Temperature: -20°C. (-4°F.)
 - c. Input Voltage: 120 - 277V (±10%) at 60 Hz.
 - d. Integral short circuit, open circuit, and overload protection.
 - e. Power Factor: ≥ 0.95.
 - f. Total Harmonic Distortion: ≤ 10%.
 - g. Comply with FCC 47 CFR Part 15.
 4. LED modules shall include the following features unless otherwise indicated:
 - a. Comply with IES LM-79 and LM-80 requirements.
 - b. Minimum CRI 80 and color temperature 4000°K unless otherwise specified in LIGHTING FIXTURE SCHEDULE.
 - c. Minimum Rated Life: 50,000 hours per IES L70.
 - d. Light output lumens as indicated in the LIGHTING FIXTURE SCHEDULE.
 5. Refer to the drawings for the luminaire schedule, mounting type and heights, lamp type and quantities.
 6. Dimmable LED fixtures shall have a 0-10 volt dimming driver, as shown on the drawings
 7. Provide fixtures as shown on the drawings and listed in Fixture Schedule. The work shall include all labor, materials, canopies, suspension of proper length, sockets, holders, reflectors, ballasts, diffusing materials, louvers, plaster frames, recessing boxes, etc., for the proper installation of the fixture. Provide adequate supporting facilities for lighting system as specified or shown on drawings.
 8. Provide emergency battery power integral to light fixtures for the minimum life safety requirements per the Michigan Building Code. Emergency battery shall provide ample power to produce a minimum of 1400 lumens of light over the required time duration. Shall have test switch and indication LED mounted into the exterior frame of the fixture and visible without opening or removing any parts of the fixture.

2.3 EMERGENCY LIGHT SET, EXIT SIGN

- A. Self-contained, battery powered, thermoplastic exit sign unit, universal mounting.
1. Lamps: Manufacturer's standard LED lamp furnished with unit.

2. Style, shape, trim, material, finish, and arrangement of housing as indicated.
3. Mounting provisions shall suit individual installation conditions.
4. Battery: Sealed, maintenance-free, nickel-cadmium type, with 10-year nominal life.
5. Charger: Minimum 2-rate, fully automatic, solid-state type, with sealed transfer relay.
6. Finish: White Thermoplastic finish lamp housing
7. Emergency battery backup unit integral with sign.
8. Self-diagnostic capabilities for required testing of emergency battery unit.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install interior and exterior building lighting units in accordance with NEC, local codes, manufacturer's recommendations, and other applicable standards and practices to provide a high quality installation.
- B. Support fixture directly from building structure, by rod hangers and inserts or metal formed channels supported from framing structure at ceiling suspension system. Do not support fixtures directly from ceiling grid unless listed for grid mounting.
- C. Install recessed luminaires to permit removal from below, to gain access to outlet or pre-wired fixture box.
- D. Connect recessed luminaire to boxes with flexible conduit, 6 ft. maximum, and fixture wire where allowed by code.
- E. In placing outlets, fixtures (surface mounted, recessed, and semi-recessed) maintain alignment, spacing, layout, and general arrangements as shown on the drawings.
- F. Set emergency lighting units plumb, square, and level with ceiling and walls and secure in accordance with manufacturer's written instructions and approved shop drawings. Conform to the requirements of NFPA 70. Mounting heights specified or indicated are to bottom of fixture for suspended or ceiling-mounted fixtures and to center of fixture for wall mounted fixtures.
- G. Minor variations from drawing dimensions may be made to clear construction interferences or other mechanical obstructions. Final arrangements shall present a symmetrical appearance as approved by the Engineer.

3.2 EMERGENCY LIGHTING

- A. Test and verify proper operation and calibration.
 1. Submit installation/user's manual(s) with complete instructions for locating, mounting, interconnection, and wiring of the system with operating and preventive maintenance procedures.
- B. Warranty: The system shall be guaranteed, under normal and proper use, against defects in workmanship and materials for a period of two years from the date of shipment. Batteries supplied as part of the systems shall be covered under a separate pro-rata warranty as described below.
 1. Sealed Lead Calcium VRLA, 10-year life expectancy - one-year full replacement warranty plus an additional nine years pro-rata.
 2. Note: Batteries must be installed on the system's energized charging circuit within 90 days from date of shipment to maintain the validity of the warranty. Battery life and capacity is rated at an optimum operating temperature range of 68°F to 85°F.

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Operating temperatures outside this range will affect battery life and capacity.
Batteries are rated at 100% capacity at 77°F.

END OF SECTION