

PROJECT MANUAL

Gorman Park

City of Saint Peter, MN

Saint Peter, MN

City Project No.: 22-150

Bid no.

Date: December 24, 2024



CERTIFICATIONS PAGE

PROJECT MANUAL

For

Gorman Park

Damon Farber Project No.: 22-150

City of Saint Peter, MN

Saint Peter, MN

I hereby certify that this document was prepared by me or under my direct supervision, and that I am a duly licensed Landscape Architect under the laws of the State of Minnesota.

Date: December 24, 2024

Site Improvements

Landscape Architect Signature:



Typed or Printed Name:

Thomas Whitlock

Date: 12/24/2024

License Number: 26292

Civil Engineer Signature:



Typed or Printed Name:

Jeffrey A. Domras

Date: 12/24/2024

License Number: 26464

Electrical Engineer Signature:



Typed or Printed Name:

Jeffrey A. Piehl

Date: 12/24/2024

License Number: 43926

TABLE OF CONTENTS

Gorman Park
Damon Farber Project No.: 22-150
City of Saint Peter, MN

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CONTRACT DOCUMENTS:

PROJECT MANUAL:

Introductory Information, Bidding Requirements, Contract Forms and Conditions of Contract

00 01 05	CERTIFICATIONS PAGE – DF/
00 01 10	TABLE OF CONTENTS – DF/
00 11 13	ADVERTISEMENT FOR BIDS – B&M
00 21 13	INSTRUCTIONS TO BIDDERS – B&M
00 41 00	BID FORMS – B&M
00 43 13	BID SECURITY FORM – B&M
00 45 11	RESPONSIBLE CONTRACTOR VERIFICATION AND CERTIFICATION OF COMPLIANCE – B&M
00 51 00	NOTICE OF AWARD – B&M
00 51 11	ADDITIONAL SUBCONTRACTORS LIST – B&M
00 52 00	AGREEMENT FORMS – B&M
00 55 00	NOTICE TO PROCEED – B&M
00 61 13.13	PERFORMANCE BOND FORM – B&M
00 61 13.16	PAYMENT BOND FORM – B&M
00 61 13.19	WARRANTY BOND FORM – B&M
00 72 00	C-700 2018 STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT – B&M
00 73 00	C-800 2018 SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT – B&M
01 21 16	CONTINGENCY ALLOWANCES – B&M
01 41 00	REGULATORY REQUIREMENTS – B&M
01 41 26	PERMIT REQUIREMENTS – B&M
01 42 19	REFERENCE STANDARDS – B&M
01 45 00	QUALITY CONTROL – B&M
01 55 17	HAUL ROUTES AND TEMPORARY ACCESS – B&M
01 55 26	TRAFFIC CONTROL – B&M
01 56 39	TEMPORARY TREE AND PLANT PROTECTION – DF/
01 57 13	TEMPORARY EROSION & SEDIMENT CONTROL – B&M
02 41 13	SELECTIVE SITE DEMOLITION – B&M

Specifications

11 68 00	PLAY FIELD EQUIPMENT AND STRUCTURES – DF/
26 00 01	GENERAL PROVISIONS – NRA
26 05 19	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES – NRA
26 05 26	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS – NRA
26 05 29	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS – NRA
26 05 33	RACEWAYS AND BOXES – NRA
26 05 53	IDENTIFICATION FOR ELECTRICAL SYSTEMS – NRA
26 05 83	WIRING CONNECTIONS – NRA
26 09 23	LIGHTING CONTROL DEVICES – NRA
26 24 16	PANELBOARDS – NRA
26 27 26	WIRING DEVICES – NRA
26 28 13	FUSES – NRA
26 28 16	DISCONNECT SWITCHES – NRA
26 29 13	ENCLOSED CONTROLLERS (MOTOR STARTERS) – NRA
26 51 00	LIGHTING – NRA
31 01 21	APPLICATION OF WATER – B&M

31 11 00	CLEARING AND GRUBBING – B&M
31 20 00	EARTH MOVING – B&M
31 23 13	SUBGRADE PREPARATION – B&M
32 11 23	AGGREGATE BASE COURSES – B&M
32 13 16	DECORATIVE CONCRETE PAVING – DF/
32 15 40	STABILIZED AGGREGATE PAVING – DF/
32 16 14	CURBS, GUTTERS, AND DRIVEWAYS – B&M
32 16 23.13	CONCRETE WALKS – B&M
32 18 13	SYNTHETIC GRASS SURFACING – DF/
33 01 30.86	MANHOLE RIM ADJUSTMENT – B&M
33 05 06	TRENCHING AND BACKFILLING – B&M
33 14 00	WATER UTILITY TRANSMISSION AND DISTRIBUTION – B&M
32 33 00	SITE FURNISHINGS – DF/
33 41 00	SUBDRAINAGE – B&M
33 42 00	STORMWATER CONVEYANCE – B&M
32 84 00	PLANTING IRRIGATION – DF/
329113	SOIL PREPARATION – DF/
32 92 00	TURF AND GRASSES – DF/
32 92 19	NATIVE SEEDING – DF/
32 93 00	PLANTS – DF/

DRAWINGS (UNDER SEPARATE COVER):

44 sheets numbered G000 through LPC1, inclusive, dated 12/24/2024, and with each sheet bearing the following general title:

Gorman Park – Phase 1
Damon Farber Project No.: 22-150
City of Saint Peter, MN

*******END OF SECTION*******

ADVERTISEMENT FOR BIDS

Gorman Park
Damon Farber Project No.: 22-150
City of Saint Peter, MN

RECEIPT AND OPENING OF PROPOSALS: Sealed proposals for the work described below will be received online through QuestCDN.com until 11:00 AM on January 23, 2025, at which time the bids will be opened and publicly read.

DESCRIPTION OF WORK: The work includes the construction of approximately 2.5 acres of park improvements at Gorman Park in Saint Peter, MN. The project involves:

- Demolition and Site Preparation: Removal of existing structures and utilities, earthwork, grading, and site clearing to prepare for new installations.
- Playground Preparation Construction: Installation of various concrete paving, and supporting infrastructure. This includes curbs, pathways, and site furnishings, all designed to enhance accessibility and safety.
- Landscaping and Plantings: Incorporation of native and ornamental plantings, tree protection measures, and new irrigation systems to maintain the park's ecology and aesthetics.
- Stormwater Management: Implementation of stormwater control measures, including grading and drainage systems, erosion control, and water quality improvements.
- Utility Work: Coordination and installation of utilities to support park facilities, including electrical systems for lighting and water connections.
- Site Amenities and Furnishings: Addition of benches, shade structures, trash receptacles, and other park amenities to enhance visitor experience.

Construction will be completed in two phases. Phase 1 will focus on the playground area and Phase 2 on the splash pad and additional site features. Bids for Phase 2 improvements will be solicited later.

COMPLETION OF WORK: All work under the Contract must be complete by October 31, 2025.

PLAN HOLDERS LIST, ADDENDUMS AND BID TABULATION: The plan holders list, addendums and bid tabulations will be available for download on-line at www.questcdn.com. Any addendums may also be distributed by mail, fax, or email.

TO OBTAIN BID DOCUMENTS: Complete digital project bidding documents are available at www.questcdn.com. You may view the digital plan documents for free by entering Quest project # 9466694 on the website's Project Search page. Documents may be downloaded for \$50.00. Please contact QuestCDN.com at 952-233-1632 or info@questcdn.com for assistance in free membership registration, viewing, downloading, and working with this digital project information.

BID SUBMITTAL: A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement to bid. For this project, the Owner will be accepting online electronic bids through QuestCDN. To access the electronic bid form, download the project documents and click the online bidding button at the top of the advertisement. Prospective bidders must be on the plan holders list through QuestCDN for bids to be accepted.

BID SECURITY: A certified check or proposal bond in the amount of not less than 5 percent of the total amount bid, drawn in favor of City shall accompany each bid.

OWNER'S RIGHTS RESERVED: The Owner reserves the right to reject any or all bids and to waive any irregularities and informalities therein and to award the Contract to other than the lowest bidder if, in their discretion, the interest of the Owner would be best served thereby.

DATED: December 10, 2024 /S/ Todd Prafke
City Administrator

Published:
QuestCDN: December 18, 2024
Saint Peter Herald: December 26, 2024

******END OF SECTION******

INSTRUCTIONS TO BIDDERS

	Page
ARTICLE 1 – Defined Terms	2
ARTICLE 2 – Bidding Documents	2
ARTICLE 4 – Pre-Bid Conference	3
ARTICLE 5 – Site and Other Areas; Existing Site Conditions; Examination of Site; Owner’s Safety Program; Other Work at the Site	3
ARTICLE 6 – Bidder’s Representations and Certifications	4
ARTICLE 7 – Interpretations and Addenda	4
ARTICLE 8 – Bid Security	5
ARTICLE 9 – Contract Times	5
ARTICLE 10 – Substitute and Or-Equal Items	5
ARTICLE 11 – Subcontractors, Suppliers, and Others	6
ARTICLE 12 – Preparation of Bid	6
ARTICLE 13 – Basis of Bid	7
ARTICLE 14 – Submittal of Bid	8
ARTICLE 15 –Modification and Withdrawal of Bid	8
ARTICLE 16 – Opening of Bids	8
ARTICLE 17 – Bids to Remain Subject to Acceptance	8
ARTICLE 18 – Evaluation of Bids and Award of Contract	8
ARTICLE 19 – Bonds and Insurance	9
ARTICLE 20 – Signing of Agreement	9
ARTICLE 21 – Sales and Use Taxes	10
ARTICLE 22 – Contracts to Be Assigned	10

ARTICLE 1—DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:
- A. Issuing Office—The office from which the Bidding Documents are to be issued, and which registers plan holders.

ARTICLE 2—BIDDING DOCUMENTS

- 2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Agreement for a list of the Contract Documents. It is Bidder's responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.
- 2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.
- 2.03 Bidder may register as a plan holder and obtain complete sets of Bidding Documents, in the number and format stated in the Advertisement or invitation to bid. Bidders may rely that sets of Bidding Documents obtained in this manner are complete unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.
- 2.04 Owner is not responsible for omissions in Bidding Documents or other documents obtained from plan rooms or other sources, or for a Bidder's failure to obtain Addenda if they are not a registered plan holder.
- 2.05 *Electronic Documents*
- A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.
1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader. It is the intent of the Landscape Architect and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Landscape Architect cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Landscape Architect cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.
- B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.05.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.

ARTICLE 3—PRE-BID CONFERENCE

3.01 A pre-bid conference will not be conducted for this Project.

ARTICLE 4—SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER’S SAFETY PROGRAM; OTHER WORK AT THE SITE

4.01 *Site and Other Areas*

- A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

4.02 *Existing Site Conditions*

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:
 - a. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.
 - b. Those drawings known to Owner of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data.
 - c. Reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.
 - 1) Technical Data contained in such reports and drawings.
2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.
3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

- B. *Underground Facilities*: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05 of the General Conditions, and not in the drawings referred to in Paragraph 5.02.A of these Instructions to Bidders. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

4.03 *Other Site-related Documents*

- A. In addition to the documents regarding existing Site conditions referred to in Paragraph 5.02.A, the following other documents relating to conditions at or adjacent to the Site are known to Owner and made available to Bidders for reference:
 1. No other site related documents are available.

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4.04 *Site Visit and Testing by Bidders*

- A. Bidder is required to visit the Site and conduct a thorough visual examination of the Site and adjacent areas. During the visit, the Bidder must not disturb any ongoing operations at the Site.
- B. Bidder shall conduct the required Site visit during normal working hours.
- C. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.
- D. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder general access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site. Bidder is responsible for establishing access needed to reach specific selected test sites.
- E. Bidder must comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.
- F. Bidder must fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

4.05 *Owner's Safety Program*

- A. Site visits and work at the Site may be governed by an Owner safety program. If an Owner safety program exists, it will be noted in the Supplementary Conditions.

4.06 *Other Work at the Site*

- A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 5—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

5.01 Express Representations and Certifications in Bid Form, Agreement

- A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder's examination of Project documentation, Site visit, and preparation of the Bid, and certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should review these representations and certifications and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.
- B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.

ARTICLE 6—INTERPRETATIONS AND ADDENDA

- 6.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.

6.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Landscape Architect in writing to the Issuing Office. Contact information and submittal procedures for such questions are as follows:

310 4th Ave S Suite 7050, Minneapolis, MN 55415, (612) 332-7522

6.03 Interpretations or clarifications considered necessary by Landscape Architect in response to such questions will be issued by Addenda delivered to all registered plan holders. Questions received less than seven days prior to the date for opening of Bids may not be answered.

6.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

ARTICLE 7—BID SECURITY

7.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5 percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a Bid bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions. Such Bid bond will be issued in the form included in the Bidding Documents or the unmodified EJCDC version of the same form.

7.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract and furnish the required Contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited, in whole in the case of a penal sum bid bond, and to the extent of Owner's damages in the case of a damages-form bond. Such forfeiture will be Owner's exclusive remedy if Bidder defaults.

7.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

7.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within 7 days after the Bid opening.

ARTICLE 8—CONTRACT TIMES

8.01 The number of days within which, or the dates by which, the Work is to be (a) substantially completed and (b) ready for final payment, and (c) Milestones (if any) are to be achieved, are set forth in the Agreement.

8.02 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 9—SUBSTITUTE AND "OR EQUAL" ITEMS

9.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration during the bidding and Contract award process of possible substitute or "or-equal" items. In cases in which the Contract allows the Contractor to request that Landscape Architect authorize the use of a substitute or "or-equal" item of material or equipment, application for such acceptance may not be made to and will not be considered by Landscape Architect until after the Effective Date of the Contract.

- 9.02 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those “or-equal” or substitute or materials and equipment subsequently approved by Landscape Architect prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Landscape Architect as an “or-equal” or substitute unless written request for approval has been submitted by Bidder and has been received by Landscape Architect within 10 days of the issuance of the Advertisement for Bids or invitation to Bidders. Each such request must comply with the requirements of Paragraphs 7.05 and 7.06 of the General Conditions, and the review of the request will be governed by the principles in those paragraphs. The burden of proof of the merit of the proposed item is upon Bidder. Landscape Architect’s decision of approval or disapproval of a proposed item will be final. If Landscape Architect approves any such proposed item, such approval will be set forth in an Addendum issued to all registered Bidders. Bidders cannot rely upon approvals made in any other manner.
- 9.03 All prices that Bidder sets forth in its Bid will be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of “or-equal” or substitution requests are made at Bidder’s sole risk.

ARTICLE 10—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- 10.01 A Bidder must be prepared to retain specific Subcontractors and Suppliers for the performance of the Work if required to do so by the Bidding Documents or in the Specifications. If a prospective Bidder objects to retaining any such Subcontractor or Supplier and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.
- 10.02 The apparent Successful Bidder, and any other Bidder so requested, must submit to Owner a list of the Subcontractors or Suppliers proposed for the following portions of the Work within five days after Bid opening:
- A. Gorman Park Improvements
- 10.03 If requested by Owner, such list must be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor or Supplier. If Owner or Landscape Architect, after due investigation, has reasonable objection to any proposed Subcontractor or Supplier, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder will submit a substitute, Bidder’s Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.
- 10.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors and Suppliers. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor or Supplier, so listed and against which Owner or Landscape Architect makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Landscape Architect subject to subsequent revocation of such acceptance as provided in Paragraph 7.07 of the General Conditions.

ARTICLE 11—PREPARATION OF BID

- 11.01 The Bid Form is included with the Bidding Documents.
- A. All blanks on the Bid Form must be completed.

- B. Paper bids, if applicable, must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form.
 - C. A Bid price must be indicated for each section, bid item, alternate, adjustment unit price item, and unit price item listed therein.
 - D. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words “No Bid” or “Not Applicable.”
- 11.02 When submitting a paper bid, if Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.
- 11.03 A Bid by a corporation must be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation must be shown.
- 11.04 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership must be shown.
- 11.05 A Bid by a limited liability company must be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown.
- 11.06 A Bid by an individual must show the Bidder’s name and official address.
- 11.07 A Bid by a joint venture must be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture must be shown.
- 11.08 When submitting a paper bid, all names must be printed in ink below the signatures.
- 11.09 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.
- 11.10 Postal and e mail addresses and telephone number for communications regarding the Bid must be shown.
- 11.11 The Bid must contain evidence of Bidder’s authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.
- 11.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder’s licensure, or Bidder must certify in writing that it will obtain such licensure within the time for acceptance of Bids and attach such certification to the Bid. Bidder’s state contractor license number, if any, must also be shown on the Bid Form.

ARTICLE 12—BASIS OF BID

- 12.01 Lump Sum

- 12.02 Bidders must submit a Bid on a lump sum basis as set forth in the Bid Form.
- 12.03 Allowances
- 12.04 For cash allowances the Bid price must include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 13.02.B of the General Conditions.

ARTICLE 13—SUBMITTAL OF BID

- 13.01 The Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 2 of the Bid Form.
- 13.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid. Paper bids, if applicable, must be enclosed in a plainly marked package with the Project title, and, if applicable, the designated portion of the Project for which the Bid is submitted, the name and address of Bidder, and must be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid must be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid must be addressed to the location designated in the Advertisement.
- 13.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted. Paper bids that are not accepted will be returned to the Bidder unopened.

ARTICLE 14—MODIFICATION AND WITHDRAWAL OF BID

- 14.01 An unopened Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.
- 14.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 15.01 and submit a new Bid prior to the date and time for the opening of Bids.
- 14.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, the Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, the Bidder will be disqualified from further bidding on the Work.

ARTICLE 15—OPENING OF BIDS

- 15.01 Bids will be opened at the time and place indicated in the advertisement or invitation to bid and, unless obviously non-responsive, read aloud publicly. A tabulation of the total amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 16—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

- 16.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 17—EVALUATION OF BIDS AND AWARD OF CONTRACT

- 17.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.

- 17.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.
- 17.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, whether in the Bid itself or in a separate communication to Owner or Landscape Architect, then Owner will reject the Bid as nonresponsive.
- 17.04 If Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest responsive Bid.
- 17.05 *Evaluation of Bids*
- A. In evaluating Bids, Owner will consider whether the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.
 - B. For the determination of the apparent low Bidder(s) when alternate(s) are submitted, Bids will be compared on the basis of the sum of the base bid and the alternate(s) selected by the Owner for award.
 - C. For determination of the apparent low Bidder(s) when sectional bids are submitted, Bids will be compared on the basis of the aggregate of the Bids for separate sections and the Bids for combined sections that result in the lowest total amount for all of the Work.
 - D. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.
 - E. For the determination of the apparent low Bidder when cost-plus-fee bids are submitted, Bids will be compared on the basis of the Guaranteed Maximum Price set forth by Bidder on the Bid Form.
- 17.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.
- 17.07 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 18—BONDS AND INSURANCE

- 18.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds, other required bonds (if any), and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by required bonds and insurance documentation.
- 18.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

ARTICLE 19—SIGNING OF AGREEMENT

- 19.01 When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder must execute and deliver the required number of counterparts of the Agreement and any bonds and insurance documentation required to be delivered by the Contract Documents to Owner. Within 10 days thereafter, Owner will deliver one fully executed

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counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 20—SALES AND USE TAXES

20.01 Sales tax is to be included in the Bid.

ARTICLE 21—CONTRACTS TO BE ASSIGNED

21.01 No Supplementary Conditions in this Article.

Items to Be Submitted with the Bid

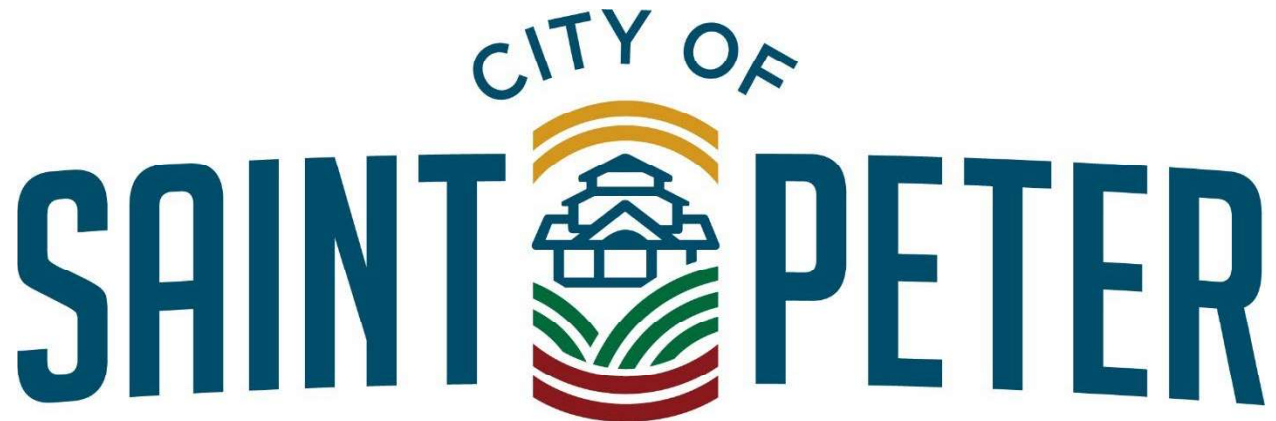
for

Gorman Park

Damon Farber Project No.: 22-150

City of Saint Peter, MN

Saint Peter, MN



BID FORMS

Gorman Park
City of Saint Peter, MN
Damon Farber Project No.: 22-150

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Conditions.

ARTICLE 1—OWNER AND BIDDER

- 1.01 This Bid is submitted to: City of Saint Peter, 227 South Front Street, Saint Peter, MN 56082-2513. Refer to the Advertisement for Bids for submittal location, format, and deadline for consideration.
- 1.02 Bids may also be submitted electronically through QuestCDN.
- 1.03 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

- 2.01 The following documents are submitted with and made a condition of this Bid:
 - A. Required Bid security;
 - B. Section 00 45 11 Responsible Contractor Verification and Certification of Compliance Prime Contractor Bid Form Attachment of this Project Manual.

ARTICLE 3—BASIS OF BID

- 3.01 Lump Sum Bids
- 3.02 Bidder will complete the Work in accordance with the Contract Documents for the following lump sum (stipulated) price(s), together with any Unit Prices indicated in Paragraph 3.02:
 - A. Lump Sum Price

Lump Sum Bid Price	\$
--------------------	----

ARTICLE 4—TIME OF COMPLETION

- 4.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

ARTICLE 5—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

- 5.01 Bid Acceptance Period
 - A. This Bid will remain subject to acceptance for 61 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.
- 5.02 Instructions to Bidders
 - A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

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5.03 Receipt of Addenda

A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

ARTICLE 6—BIDDER’S REPRESENTATIONS AND CERTIFICATIONS

6.01 Bidder’s Representations

- A. In submitting this Bid, Bidder represents the following:
1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
 2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
 4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
 5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
 6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder’s (Contractor’s) safety precautions and programs.
 7. Based on the information and observations referred to in the preceding paragraph, Bidder 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.
 8. Bidder 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 Bidding Documents.

9. Bidder has given Landscape Architect written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Landscape Architect is acceptable to Contractor.
10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

6.02 Bidder's Certifications

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.
2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
3. Bidder has not solicited or induced any individual or entity to refrain from bidding.
4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 6.02.A:
 - a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.
 - b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
 - c. 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.
 - d. 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.

BIDDER hereby submits this Bid as set forth above:

Bidder:

(typed or printed name of organization)

By: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(typed or printed)

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

Attest: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(typed or printed)

Address for giving notices:

Bidder's Contact:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Phone: _____

Email: _____

Address: _____

Bidder's Contractor License No.: (if applicable) _____

BID SECURITY FORM

<p>Bidder</p> <p>Name: _____</p> <p>Address (<i>principal place of business</i>): _____</p>	<p>Surety</p> <p>Name: _____</p> <p>Address (<i>principal place of business</i>): _____</p>
<p>Owner</p> <p>Name: City of Saint Peter</p> <p>Address (<i>principal place of business</i>): 227 South Front Street Saint Peter, MN 56082-2513</p>	<p>Bid</p> <p>Project (<i>name and location</i>): Gorman Park Damon Farber Project No.: 22-150</p> <p><u>Bid Due Date:</u> _____</p>
<p>Bond</p> <p>Penal Sum: _____</p> <p>Date of Bond: _____</p>	
<p>Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.</p>	
<p>Bidder</p> <p>_____</p> <p style="text-align: center;"><i>(Full formal name of Bidder)</i></p>	<p>Surety</p> <p>_____</p> <p style="text-align: center;"><i>(Full formal name of Surety) (corporate seal)</i></p>
<p>By: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>	<p>By: _____</p> <p style="text-align: center;"><i>(Signature) (Attach Power of Attorney)</i></p>
<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>	<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>
<p>Title: _____</p>	<p>Title: _____</p>
<p>Attest: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>	<p>Attest: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>
<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>	<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>
<p>Title: _____</p>	<p>Title: _____</p>
<p><i>Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.</i></p>	

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation will be null and void if:
 - 3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
 - 3.2. All Bids are rejected by Owner
 - 3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

RESPONSIBLE CONTRACTOR VERIFICATION AND CERTIFICATION OF COMPLIANCE

PRIME CONTRACTOR BID FORM ATTACHMENT

Damon Farber Project No.: 22-150

This form includes changes by statutory references from the Laws of Minnesota 2015, chapter 64, sections 1-9. This form must be submitted with the bid form submitted for this project. A bid form received without this form, may be rejected.

<p>Minn. Stat. § 16C.285, Subd. 7. IMPLEMENTATION. ... any prime contractor or subcontractor or motor carrier that does not meet the minimum criteria in subdivision 3 or fails to verify that it meets those criteria is not a responsible contractor and is not eligible to be awarded a construction contract for the project or to perform work on the project...</p>	
<p>Minn. Stat. § 16C.285, Subd. 3. RESPONSIBLE CONTRACTOR, MINIMUM CRITERIA. "Responsible contractor" means a contractor that conforms to the responsibility requirements in the solicitation document for its portion of the work on the project and verifies that it meets the following minimum criteria:</p>	
(1)	<p>The Contractor:</p> <ul style="list-style-type: none">(i) is in compliance with workers' compensation and unemployment insurance requirements;(ii) is in compliance with Department of Revenue and Department of Employment and Economic Development registration requirements if it has employees;(iii) has a valid federal tax identification number or a valid Social Security number if an individual; and(iv) has filed a certificate of authority to transact business in Minnesota with the Secretary of State if a foreign corporation or cooperative.
(2)	<p>The contractor or related entity is in compliance with and, during the three-year period before submitting the verification, has not violated section 177.24, 177.25, 177.41 to 177.44, 181.03, 181.101, 181.13, 181.14, or 181.722, and has not violated United States Code, title 29, sections 201 to 219, or United States Code, title 40, sections 3141 to 3148. For purposes of this clause, a violation occurs when a contractor or related entity:</p> <ul style="list-style-type: none">(i) repeatedly fails to pay statutorily required wages or penalties on one or more separate projects for a total underpayment of \$25,000 or more within the three-year period, provided that a failure to pay is "repeated" only if it involves two or more separate and distinct occurrences of underpayment during the three-year period;(ii) has been issued an order to comply by the commissioner of Labor and Industry that has become final;(iii) has been issued at least two determination letters within the three-year period by the Department of Transportation finding an underpayment by the contractor or related entity to its own employees;(iv) has been found by the commissioner of Labor and Industry to have repeatedly or willfully violated any of the sections referenced in this clause pursuant to section 177.27;(v) has been issued a ruling or findings of underpayment by the administrator of the Wage and Hour Division of the United States Department of Labor that have become final or have been upheld by an administrative law judge or the Administrative Review Board; or(vi) has been found liable for underpayment of wages or penalties or misrepresenting a construction worker as an independent contractor in an action brought in a court having jurisdiction. Provided that, if the contractor or related entity contests a determination of underpayment by the Department of Transportation in a contested case proceeding, a violation does not occur until the contested case proceeding has concluded with a determination that the contractor or related entity underpaid wages or penalties;*
(3)	<p>The contractor or related entity is in compliance with and, during the three-year period before submitting the verification, has not violated section 181.723 or chapter 326B. For purposes of this clause, a violation occurs when a contractor or related entity has been issued a final administrative or licensing order;*</p>

This document is a MODIFIED version of the MnDOT Responsible Contractor Verification and Certification of Compliance form

Damon Farber Landscape Architects

RESPONSIBLE CONTRACTOR VERIFICATION AND
CERTIFICATION OF COMPLIANCE

Project No. 22-150

PAGE 00 45 11-1

(4)	The contractor or related entity has not, more than twice during the three-year period before submitting the verification, had a certificate of compliance under section 363A.36 revoked or suspended based on the provisions of section 363A.36, with the revocation or suspension becoming final because it was upheld by the Office of Administrative Hearings or was not appealed to the office;*
(5)	The contractor or related entity has not received a final determination assessing a monetary sanction from the Department of Administration or Transportation for failure to meet targeted group business, disadvantaged business enterprise, or veteran-owned business goals, due to a lack of good faith effort, more than once during the three-year period before submitting the verification;*
	*Any violations, suspensions, revocations, or sanctions, as defined in clauses (2) to (5), occurring prior to July 1, 2014, shall not be considered in determining whether a contractor or related entity meets the minimum criteria.
(6)	The contractor or related entity is not currently suspended or debarred by the federal government or the state of Minnesota or any of its departments, commissions, agencies, or political subdivisions that have authority to debar a contractor; and
(7)	All subcontractors and motor carriers that the contractor intends to use to perform project work have verified to the contractor through a signed statement under oath by an owner or officer that they meet the minimum criteria listed in clauses (1) to (6).

Minn. Stat. § 16C.285, Subd. 5. **SUBCONTRACTOR VERIFICATION.**

A prime contractor or subcontractor shall include in its verification of compliance under subdivision 4 a list of all of its first-tier subcontractors that it intends to retain for work on the project. Prior to execution of a construction contract, and as a condition precedent to the execution of a construction contract, the apparent successful prime contractor shall submit to the contracting authority a supplemental verification under oath confirming compliance with subdivision 3, clause (7). Each contractor or subcontractor shall obtain from all subcontractors with which it will have a direct contractual relationship a signed statement under oath by an owner or officer verifying that they meet all of the minimum criteria in subdivision 3 prior to execution of a construction contract with each subcontractor.

If a prime contractor or any subcontractor retains additional subcontractors on the project after submitting its verification of compliance, the prime contractor or subcontractor shall obtain verifications of compliance from each additional subcontractor with which it has a direct contractual relationship and shall submit a supplemental verification confirming compliance with subdivision 3, clause (7), within 14 days of retaining the additional subcontractors.

A prime contractor shall submit to the contracting authority upon request copies of the signed verifications of compliance from all subcontractors of any tier pursuant to subdivision 3, clause (7). A prime contractor and subcontractors shall not be responsible for the false statements of any subcontractor with which they do not have a direct contractual relationship. A prime contractor and subcontractors shall be responsible for false statements by their first-tier subcontractors with which they have a direct contractual relationship only if they accept the verification of compliance with actual knowledge that it contains a false statement.

Subd. 5a. Motor carrier verification. A prime contractor or subcontractor shall obtain annually from all motor carriers with which it will have a direct contractual relationship a signed statement under oath by an owner or officer verifying that they meet all of the minimum criteria in subdivision 3 prior to execution of a construction contract with each motor carrier. A prime contractor or subcontractor shall require each such motor carrier to provide it with immediate written notification in the event that the motor carrier no longer meets one or more of the minimum criteria in subdivision 3 after submitting its annual verification. A motor carrier shall be ineligible to perform work on a project covered by this section if it does not meet all the minimum criteria in subdivision 3. Upon request, a prime contractor or subcontractor shall submit to the contracting authority the signed verifications of compliance from all motor carriers providing for-hire transportation of materials, equipment, or supplies for a project.

Minn. Stat. § 16C.285, Subd. 4. **VERIFICATION OF COMPLIANCE.**

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Damon Farber Landscape Architects

RESPONSIBLE CONTRACTOR VERIFICATION AND
CERTIFICATION OF COMPLIANCE

Project No. 22-150

PAGE 00 45 11-2

A contractor responding to a solicitation document of a contracting authority shall submit to the contracting authority a signed statement under oath by an owner or officer verifying compliance with each of the minimum criteria in subdivision 3, with the exception of clause (7), at the time that it responds to the solicitation document.

A contracting authority may accept a signed statement under oath as sufficient to demonstrate that a contractor is a responsible contractor and shall not be held liable for awarding a contract in reasonable reliance on that statement. A prime contractor, subcontractor, or motor carrier that fails to verify compliance with any one of the required minimum criteria or makes a false statement under oath in a verification of compliance shall be ineligible to be awarded a construction contract on the project for which the verification was submitted.

A false statement under oath verifying compliance with any of the minimum criteria may result in termination of a construction contract that has already been awarded to a prime contractor or subcontractor or motor carrier that submits a false statement. A contracting authority shall not be liable for declining to award a contract or terminating a contract based on a reasonable determination that the contractor failed to verify compliance with the minimum criteria or falsely stated that it meets the minimum criteria. A verification of compliance need not be notarized. An electronic verification of compliance made and submitted as part of an electronic bid shall be an acceptable verification of compliance under this section provided that it contains an electronic signature as defined in section 325L.02, paragraph (h).

CERTIFICATION

By signing this document, I certify that I am an owner or officer of the company, and I certify under oath that:

- 1) My company meets each of the Minimum Criteria to be a responsible contractor as defined herein and is in compliance with Minn. Stat. § 16C.285, and**
- 2) if my company is awarded a contract, I will submit Attachment A-1 prior to contract execution, and**
- 3) if my company is awarded a contract, I will also submit Attachment A-2 as required.**

Authorized Signature of Owner or Officer:

Printed Name:

Title:

Date:

Company Name:

NOTE: Minn. Stat. § 16C.285, Subd. 2, (c) If only one prime contractor responds to a solicitation document, a contracting authority may award a construction contract to the responding prime contractor even if the minimum criteria in subdivision 3 are not met.

******END OF SECTION******

This document is a MODIFIED version of the MnDOT Responsible Contractor Verification and Certification of Compliance form

Damon Farber Landscape Architects

RESPONSIBLE CONTRACTOR VERIFICATION AND
CERTIFICATION OF COMPLIANCE

Project No. 22-150

PAGE 00 45 11-3

Items to Be Executed After Bid Opening

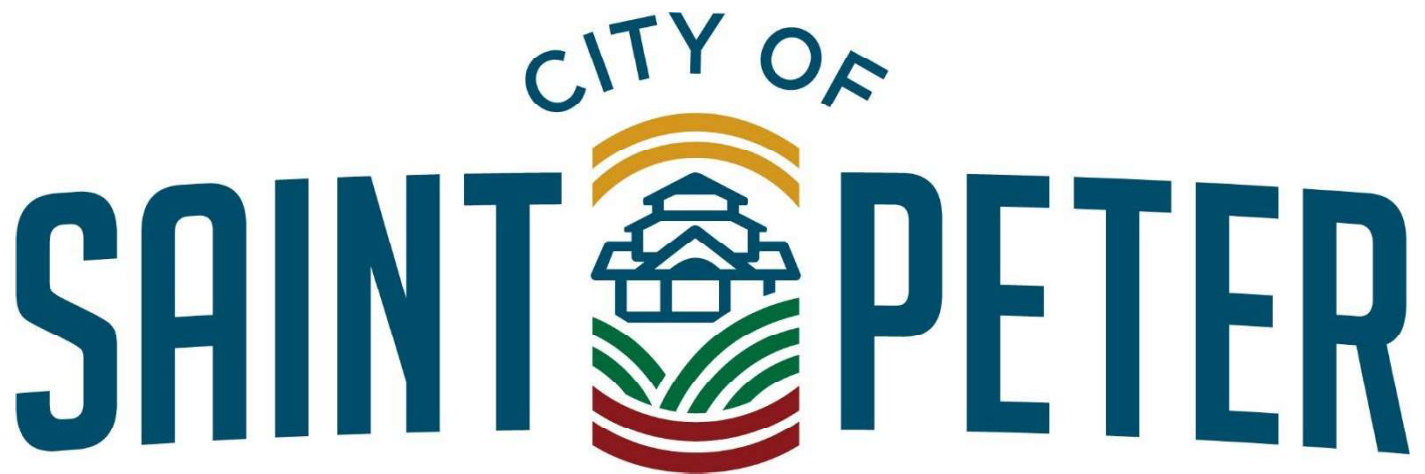
for

Gorman Park

Damon Farber Project No.: 22-150

City of Saint Peter, MN

Saint Peter, MN



NOTICE OF AWARD

Date of Issuance: December 24, 2024
Owner: City of Saint Peter, MN Owner's Project No.: Gorman Park Imp.
Landscape Architect: Damon Farber Landscape Architect's Project No.: 22-150
Project: Gorman Park
Contract Name:
Bidder:
Bidder's Address:

You are notified that Owner has accepted your Bid dated _____ for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

- 2025-2026 Gorman Park Improvements

The Contract Price of the awarded Contract is \$ _____. Contract Price is subject to adjustment based on the provisions of the Contract, including but not limited to those governing changes, Unit Price Work, and Work performed on a cost-plus-fee basis, as applicable.

Four (4) unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award or has been transmitted or made available to Bidder electronically.

Drawings will be delivered separately from the other Contract Documents.

You must comply with the following conditions precedent within 15 days of the date of receipt of this Notice of Award:

1. Deliver to Owner four (4) counterparts of the Agreement, signed by Bidder (as Contractor).
2. Deliver with the signed Agreement(s) the Contract security (such as required performance and payment bonds) and insurance documentation, as specified in the Instructions to Bidders and in the General Conditions, Articles 2 and 6.
3. Deliver to Owner executed Section 00 51 11 "ADDITIONAL SUBCONTRACTORS LIST" in accordance with Minn. Stat. 16C.285 subd.3 Subclauses (1) to (7). Delivery is a condition precedent to execution of this contract and failure to submit this form shall be cause for the Owner to cancel Award of Contract and declare your Bid security forfeited.

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within 10 days after you comply with the above conditions, Owner will return to you one fully signed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: City of Saint Peter, MN

By (signature): _____

Name (printed): Todd Prafke

Title: City Administrator

Copy: Landscape Architect

**RESPONSIBLE CONTRACTOR VERIFICATION AND CERTIFICATION OF COMPLIANCE
ATTACHMENT A-1
FIRST-TIER SUBCONTRACTORS LIST**

SUBMIT PRIOR TO EXECUTION OF A CONSTRUCTION CONTRACT

Damon Farber Project Number: 22-150

Minn. Stat. § 16C.285, Subd. 5. A prime contractor or subcontractor shall include in its verification of compliance under subdivision 4 a list of all of its first-tier subcontractors that it intends to retain for work on the project. Prior to execution of a construction contract, and as a condition precedent to the execution of a construction contract, the apparent successful prime contractor shall submit to the contracting authority a supplemental verification under oath confirming compliance with subdivision 3, clause (7). Each contractor or subcontractor shall obtain from all subcontractors with which it will have a direct contractual relationship a signed statement under oath by an owner or officer verifying that they meet all of the minimum criteria in subdivision 3 prior to execution of a construction contract with each subcontractor.

FIRST TIER SUBCONTRACTOR NAMES* (Legal name of company as registered with the Secretary of State)	Name of city where company home office is located

*Attach additional sheets as needed for submission of all first-tier subcontractors.

SUPPLEMENTAL CERTIFICATION FOR ATTACHMENT A-1	
<p>By signing this document I certify that I am an owner or officer of the company, and I certify under oath that: All first-tier subcontractors listed on attachment A-1 have verified through a signed statement under oath by an owner or officer that they meet the minimum criteria to be a responsible contractor as defined in Minn. Stat. § 16C.285.</p>	
Authorized Signature of Owner or Officer:	Printed Name:
Title:	Date:
Company Name:	

**ADDITIONAL SUBCONTRACTORS LIST
ATTACHMENT A-2
ADDITIONAL SUBCONTRACTORS LIST**

**PRIME CONTRACTOR TO SUBMIT AS SUBCONTRACTORS ARE ADDED TO THE PROJECT
Damon Farber Project Number: 22-150**

This form must be submitted to the Project Manager or individual as identified in the solicitation document.

Minn. Stat. § 16C.285, Subd. 5. If a prime contractor or any subcontractor retains additional subcontractors on the project after submitting its verification of compliance, the prime contractor or subcontractor shall obtain verifications of compliance from each additional subcontractor with which it has a direct contractual relationship and shall submit a supplemental verification confirming compliance with subdivision 3, clause (7), within 14 days of retaining the additional subcontractors.

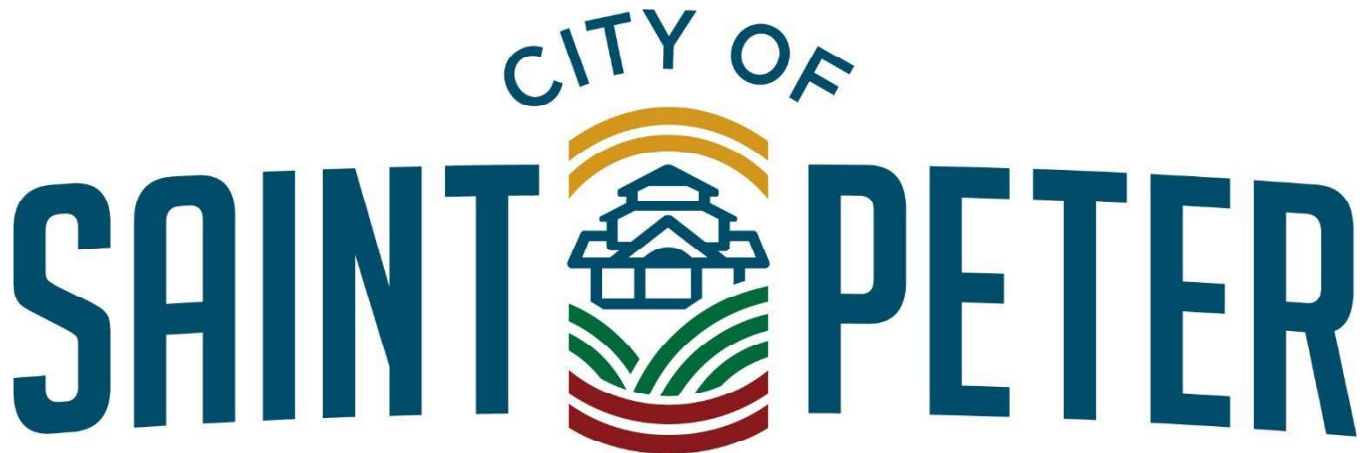
ADDITIONAL SUBCONTRACTOR NAMES* (Legal name of company as registered with the Secretary of State)	Name of city where company home office is located

*Attach additional sheets as needed for submission of all additional subcontractors.

SUPPLEMENTAL CERTIFICATION FOR ATTACHMENT A-2	
By signing this document I certify that I am an owner or officer of the company, and I certify under oath that: All additional subcontractors listed on Attachment A-2 have verified through a signed statement under oath by an owner or officer that they meet the minimum criteria to be a responsible contractor as defined in Minn. Stat. § 16C.285.	
Authorized Signature of Owner or Officer:	Printed Name:
Title:	Date:
Company Name:	

C-700 2018
Standard General Conditions
of the Construction Contract

Gorman Park
Damon Farber Project No.: 22-150
City of Saint Peter, MN
Saint Peter, MN



AGREEMENT FORMS

This Agreement is by and between City of Saint Peter, MN (“Owner”) and _____ (“Contractor”).

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

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:

- Project Gorman Park - Damon Farber Project No.: 22-150

ARTICLE 2—THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows:

- 2025-2026 Gorman Park Improvements

ARTICLE 3—LANDSCAPE ARCHITECT

3.01 The Owner has retained Damon Farber (“Landscape Architect”) to act as Owner’s representative, assume all duties and responsibilities of Landscape Architect, and have the rights and authority assigned to Landscape Architect in the Contract.

3.02 The part of the Project that pertains to the Work has been designed by Bolton & Menk, Inc.

ARTICLE 4—CONTRACT TIMES

4.01 Time Is 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 Substantial Completion

- A. Substantial completion shall be defined as:
1. The date when construction is sufficiently completed so that the owner can occupy or use the improvement for the intended purpose.
 2. For streets, highways, and bridges, the date when construction-related traffic devices and ongoing inspections are no longer required.
 3. The Contractor acknowledges that ongoing inspections are required until the conditions of all construction permits for this project are met and specifically during the following work activities: excavation, backfilling, underground utilities including water, sanitary, and storm sewer, compaction, aggregate base, paving, and removal of all traffic control signage and erosion control temporary best management practices.

4.03 Contract Times: Dates

4.04 The work will be substantially completed on or before, and completed and ready for final payment in accordance with Paragraph 15.06 of Section 00 72 00 "General Conditions" of this Project Manual on or before.

4.05 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 Contract Times, as duly modified. 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 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.
 2. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner for each day that expires after such time until the Work is completed and ready for final payment.
 3. Liquidated damages for failing to attain timely completion are not additive and will not be imposed concurrently.
- B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

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).
- B. 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 13.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Landscape Architect.
- C. For all awarded Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.
- D. The Work awarded shall include:
1. Base Bid

ARTICLE 6—PAYMENT PROCEDURES

6.01 Submittal and Processing of Payments

- A. Applications for Payment shall be submitted and processed in accordance with Article 15 of the General Conditions or as modified by the Supplemental Conditions.

6.02 Progress Payments; Retainage

- A. Owner shall make progress payments during performance of the work on the basis of Contractor's Applications for Payment dated on or about the 25th day of each month 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. 95% percent of the value of the Work completed (with the balance being retainage).
 - b. 95% percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
- B. Within 60 days of the date of Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 99 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 250 percent of Landscape Architect'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 and all final paperwork is completed. Final paperwork is defined as documents required by the contract which may include but are not limited to:
1. Operations Manuals, record documents, and submittals required by the contract documents, and
 2. Payroll documents for projects with prevailing wage requirements, and
 3. IC 134, and
 4. Lien Releases, if required.
 - a. Mn Department of Commerce Form 40.5.1.
 - b. <http://www.commerce.state.mn.us/UCB/40.5.1.pdf> or equal.

6.03 Progress Payment to Subcontractors

- A. For contracts within the State of Minnesota, MN Statute 471.425 Subd. 4a. shall apply. MN Statute 471.425 Subd. 4a. requires:
1. The prime contractor shall pay any subcontractor within ten days of the prime contractor's receipt of payment for undisputed services provided by the subcontractor.
 2. The prime contractor shall pay interest of 1-1/2 percent per month or any part of a month to the subcontractor on any undisputed amount not paid on time to the subcontractor.
 3. The minimum monthly interest penalty payment for an unpaid balance of \$100 or more is \$10. For an unpaid balance of less than \$100, the prime contractor shall pay the actual penalty due to the subcontractor.
 4. A subcontractor who prevails in a civil action to collect interest penalties from a prime contractor must be awarded its costs and disbursements, including attorney's fees, incurred in bringing the action."

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6.04 Final Payment

- A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.

6.05 Consent of Surety

- A. Owner will not make final payment or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

6.06 Interest

- A. All amounts not paid when due will bear interest at the rate of 1.5 percent per month.

ARTICLE 7—CONTRACT DOCUMENTS

7.01 Contents

- A. The Contract Documents consist of all the following:
 - 1. This Agreement.
 - 2. Bonds:
 - a. Performance bond (together with power of attorney).
 - b. Payment bond (together with power of attorney).
 - 3. General Conditions.
 - 4. Supplementary Conditions.
 - 5. Specifications as listed in the table of contents of the project manual (copy of list attached).
 - 6. Drawings as listed in the table of contents of the project manual (copy of list attached.)
 - 7. Addenda (numbers ___ to ___, inclusive).
 - 8. Exhibits to this Agreement (enumerated as follows):
 - a. Contractor's Bid (pages ___ to ___, inclusive).
 - 9. 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.
 - d. Field Orders.
 - e. Warranty Bond, if any.
- B. The Contract Documents listed in Paragraph 7.01.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 7.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 Contractor's Representations

- A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:
1. Contractor has examined and carefully studied the Contract Documents, including Addenda.
 2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
 4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
 5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
 6. 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 Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.
 7. Based on the information and observations referred to in the preceding paragraph, 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.
 8. 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.
 9. Contractor has given Landscape Architect written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Landscape Architect is acceptable to Contractor.
 10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
 11. 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.

8.02 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 8.02:
1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;

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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.

8.03 Standard General Conditions

- A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C 700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or “track changes” (redline/strikeout), or in the Supplementary Conditions.

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:

City of Saint Peter

(typed or printed name of organization)

(typed or printed name of organization)

By: _____
(individual's signature)

By: _____
(individual's signature)

Date: _____
(date signed)

Date: _____
(date signed)

Name: Todd Prafke

(typed or printed)

Name: _____
(typed or printed)

Title: City Administrator

(typed or printed)

Title: _____
(typed or printed)

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

Attest: _____
(individual's signature)

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Title: _____
(typed or printed)

Address for giving notices:

227 South Front Street

Saint Peter, MN 56082-2513

Address for giving notices:

NOTICE TO PROCEED

Owner: City of Saint Peter, MN Owner's Project No.: Gorman
Landscape Architect: Damon Farber Landscape Architect's Project No.: 22-150
Contractor: _____ Contractor's Project No.: _____
Project: Gorman Park
Contract Name: _____
Effective Date of Contract: _____

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on _____ pursuant to Paragraph 4.01 of the General Conditions.

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work will be done at the Site prior to such date.

The Substantial Completion and Final Completion must be achieved in accordance with the requirements of the Agreement.

Before starting any Work at the Site, Contractor must comply with the following: None

Owner: City of Saint Peter, MN

By (signature): _____

Name (printed): Todd Prafke

Title: City Administrator

Date Issued: _____

Copy: Landscape Architect

PERFORMANCE BOND FORM

<p>Contractor</p> <p>Name: _____</p> <p>Address <i>(principal place of business)</i>: _____</p>	<p>Surety</p> <p>Name: _____</p> <p>Address <i>(principal place of business)</i>: _____</p>
<p>Owner</p> <p>Name: City of Saint Peter</p> <p>Mailing address <i>(principal place of business)</i>: 227 South Front Street Saint Peter, MN 56082-2513</p>	<p>Contract</p> <p>Description <i>(name and location)</i>: Gorman Park Damon Farber Project No.: 22-150</p> <p>Contract Price: _____</p> <p>Effective Date of Contract: _____</p>
<p>Bond</p> <p>Bond Amount: _____</p> <p>Date of Bond: _____ <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i></p> <p>Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 16</p>	
<p>Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.</p>	
<p>Contractor as Principal</p>	<p>Surety</p>
<p>_____ <i>(Full formal name of Contractor)</i></p>	<p>_____ <i>(Full formal name of Surety) (corporate seal)</i></p>
<p>By: _____ <i>(Signature)</i></p>	<p>By: _____ <i>(Signature)(Attach Power of Attorney)</i></p>
<p>Name: _____ <i>(Printed or typed)</i></p>	<p>Name: _____ <i>(Printed or typed)</i></p>
<p>Title: _____</p>	<p>Title: _____</p>
<p>Attest: _____ <i>(Signature)</i></p>	<p>Attest: _____ <i>(Signature)</i></p>
<p>Name: _____ <i>(Printed or typed)</i></p>	<p>Name: _____ <i>(Printed or typed)</i></p>
<p>Title: _____</p>	<p>Title: _____</p>
<p><i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i></p>	

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 will 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 may 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 will 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 does 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 does 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 will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will 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 will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than 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 must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must 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 will be applicable.
12. Notice to the Surety, the Owner, or the Contractor must 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 will be deemed deleted therefrom and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.
14. Definitions

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- 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 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 will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
16. Modifications to this Bond are as follows: None

PAYMENT BOND FORM

Contractor Name: Address <i>(principal place of business)</i> :	Surety Name: Address <i>(principal place of business)</i> :
Owner Name: City of Saint Peter Mailing address <i>(principal place of business)</i> : 227 South Front Street Saint Peter, MN 56082-2513	Contract Description <i>(name and location)</i> : Gorman Park Damon Farber Project No.: 22-150 Contract Price: Effective Date of Contract:
Bond Bond Amount: Date of Bond: <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i> Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 18	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal	Surety
<i>(Full formal name of Contractor)</i>	<i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i>	

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 will 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 will 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 will 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 will 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 will 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 will 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 satisfying 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.
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 will 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 will be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will 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 will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will 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:
 - 16.1.1. The name of the Claimant;
 - 16.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;
 - 16.1.3. 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;
 - 16.1.4. A brief description of the labor, materials, or equipment furnished;

- 16.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
 - 16.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
 - 16.1.7. The total amount of previous payments received by the Claimant; and
 - 16.1.8. 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 is 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 will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
18. Modifications to this Bond are as follows: **None**

WARRANTY BOND FORM

<p>Contractor</p> <p>Name: _____</p> <p>Address (principal place of business): _____</p>	<p>Surety</p> <p>Name: _____</p> <p>Address (principal place of business): _____</p>
<p>Owner</p> <p>Name: City of Saint Peter</p> <p>Address (principal place of business):</p> <p>227 South Front Street Saint Peter, MN 56082-2513</p>	<p>Construction Contract</p> <p>Description (name and location):</p> <p>Gorman Park Damon Farber Project No.: 22-150</p> <p>Contract Price: _____</p> <p>Effective Date of Contract: _____</p> <p>Contract's Date of Substantial Completion: _____</p>
<p>Bond</p> <p>Bond Amount: _____</p> <p>Date of Bond: _____</p> <p>Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 9</p>	
<p>Bond Period: Commencing 364 days after Substantial Completion of the Work under the Construction Contract, and continuing until 2 year(s) after such Substantial Completion.</p>	
<p>Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth herein, do each cause this Warranty Bond to be duly executed by an authorized officer, agent, or representative.</p>	
<p>Contractor as Principal</p>	<p>Surety</p>
<p>_____</p> <p style="text-align: center;"><i>(Full formal name of Contractor)</i></p>	<p>_____</p> <p style="text-align: center;"><i>(Full formal name of Surety) (corporate seal)</i></p>
<p>By: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>	<p>By: _____</p> <p style="text-align: center;"><i>(Signature) (Attach Power of Attorney)</i></p>
<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>	<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>
<p>Title: _____</p>	<p>Title: _____</p>
<p>Attest: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>	<p>Attest: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>
<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>	<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>
<p>Title: _____</p>	<p>Title: _____</p>
<p><i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i></p>	

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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's Correction Period Obligations. The Construction Contract is incorporated herein by reference.
2. If the Contractor performs the Correction Period Obligations, the Surety and the Contractor shall have no obligation under this Warranty Bond.
3. If Owner gives written notice to Contractor and Surety during the Bond Period of Contractor's obligation under the Correction Period Obligations, and Contractor does not fulfill such obligation, then Surety shall be responsible for fulfillment of such Correction Period Obligations. Surety shall either fulfill the Correction Period Obligations itself, through its agents or contractors, or, in the alternative, Surety may waive the right to fulfill the Correction Period Obligations itself and reimburse the Owner for all resulting costs incurred by Owner in performing Contractor's Correction Period Obligations, including but not limited to correction, removal, replacement, and repair costs.
4. The Surety's liability is limited to the amount of this Warranty Bond. Renewal or continuation of the Warranty Bond will not modify such amount unless expressly agreed to by Surety in writing.
5. The Surety shall have no liability under this Warranty Bond for obligations of the Contractor that are unrelated to the Construction Contract. No right of action will accrue on this Warranty Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
6. Any proceeding, legal or equitable, under this Warranty 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 must be instituted within two years after the Surety refuses or fails to perform its obligations under this Warranty Bond.
7. Written notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown in this Warranty Bond.
8. Definitions
 - 8.1. Construction Contract—The agreement between the Owner and Contractor identified on the cover page of this Warranty Bond, including all Contract Documents and changes made to the agreement and the Contract Documents.
 - 8.2. Contract Documents—All the documents that comprise the agreement between the Owner and Contractor.
 - 8.3. Correction Period Obligations—The duties, responsibilities, commitments, and obligations of the Contractor with respect to correction or replacement of defective Work, as set forth in the Construction Contract's Correction Period clause, EJCDC® C 700, Standard General Conditions of the Construction Contract (2018), Paragraph 15.08, as duly modified.
 - 8.4. Substantial Completion—As defined in the Construction Contract.
 - 8.5. Work—As defined in the Construction Contract.
9. Modifications to this Bond are as follows: **None**

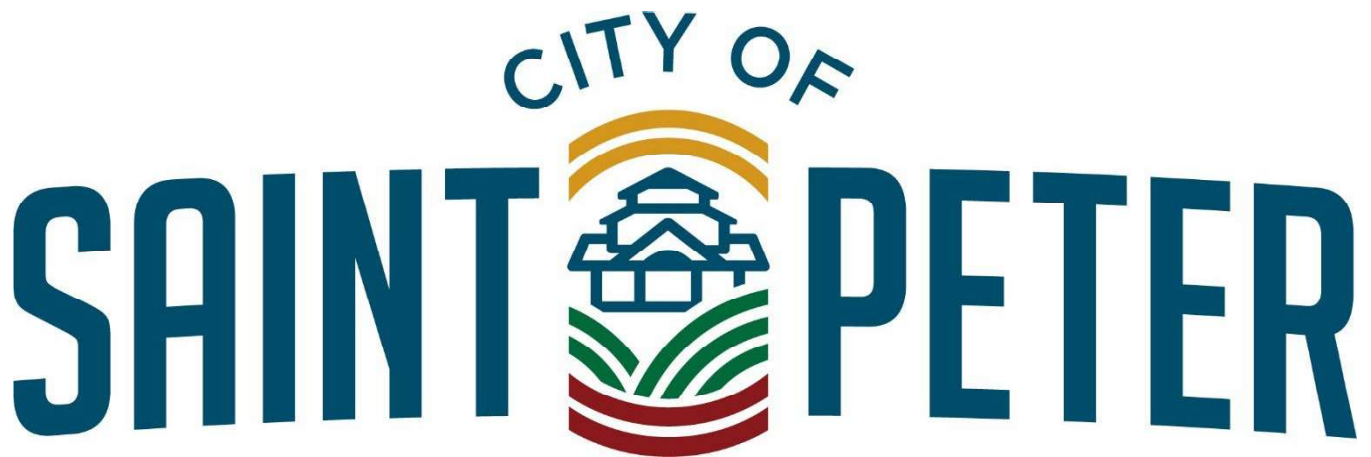
**C-800 2018
Supplementary Conditions
of the Construction Contract**

Gorman Park

Damon Farber Project No.: 22-150

City of Saint Peter, MN

Saint Peter, MN



Supplementary Conditions of the Construction Contract

	Page
ARTICLE 1–Definitions and Terminology	1
ARTICLE 2–Preliminary Matters	1
ARTICLE 3–Contract Documents: Intent, Requirements, Reuse	5
ARTICLE 4–Commencement and Progress of the Work	5
ARTICLE 5–Site, Subsurface and Physical Conditions, Hazardous Environmental Conditions	6
ARTICLE 6–Bonds and Insurance	7
ARTICLE 7–Contractor's Responsibilities	11
ARTICLE 8–Other Work at the Site	11
ARTICLE 9–Owner's Responsibility	11
ARTICLE 10–Landscape Architect's Status During Construction	12
ARTICLE 11–Changes to the Contract	12
ARTICLE 12–Claims	12
ARTICLE 13–Cost of Work; Allowances, Unit Price Work	12
ARTICLE 14–Tests and Inspections; Correction, Removal, or Acceptance of Defective Work	12
ARTICLE 15–Payments to Contractor, Set Offs; Completions; Correction Period	13
ARTICLE 16–Suspension of Work and Termination	14
ARTICLE 17–Final Resolution of Dispute	14
ARTICLE 18–Miscellaneous	14

SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

These Supplementary Conditions amend or supplement EJCDC® C 700, Standard General Conditions of the Construction Contract (2018). The General Conditions remain in full force and effect except as amended.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added—for example, "Paragraph SC-4.05."

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

The term Construction Project Representative (CPR) shall have the same meaning as RPR.

42. Substantial Completion – Substantial Completion shall be as defined in the Agreement.

ARTICLE 2—PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

- B. Evidence of Contractor's Insurance: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner copies of the policies (including all endorsements, and identification of applicable self-insured retentions and deductibles) of insurance required to be provided by Contractor in this Contract. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- C. Evidence of Owner's Insurance: After receipt from Contractor of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor copies of the policies of insurance to be provided by Owner in this Contract (if any). Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

2.02 Copies of Documents

- A. Owner shall furnish to Contractor four printed copies of the Contract Documents (including one fully signed counterpart of the Agreement), and one in electronic portable document format (PDF).

2.06 Electronic Transmittals

- B. Electronic Documents Protocol: The parties shall conform to the following provisions in Paragraphs 2.06.B and 2.06.C, together referred to as the Electronic Documents Protocol ("EDP" or "Protocol") for exchange of electronic transmittals.
 - 1. Basic Requirements
 - a. To the fullest extent practical, the parties agree to and will transmit and accept Electronic Documents in an electronic or digital format using the procedures described in this Protocol. Use of the Electronic Documents and any information

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contained therein is subject to the requirements of this Protocol and other provisions of the Contract.

- b. The contents of the information in any Electronic Document will be the responsibility of the transmitting party.
- c. Electronic Documents as exchanged by this Protocol may be used in the same manner as the printed versions of the same documents that are exchanged using non-electronic format and methods, subject to the same governing requirements, limitations, and restrictions, set forth in the Contract Documents.
- d. Except as otherwise explicitly stated herein, the terms of this Protocol will be incorporated into any other agreement or subcontract between a party and any third party for any portion of the Work on the Project, or any Project-related services, where that third party is, either directly or indirectly, required to exchange Electronic Documents with a party or with Landscape Architect. Nothing herein will modify the requirements of the Contract regarding communications between and among the parties and their subcontractors and consultants.
- e. When transmitting Electronic Documents, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the receiving party's use of software application packages, operating systems, or computer hardware differing from those established in this Protocol.
- f. Nothing herein negates any obligation 1) in the Contract to create, provide, or maintain an original printed record version of Drawings and Specifications, signed, and sealed according to applicable Laws and Regulations; 2) to comply with any applicable Law or Regulation governing the signing and sealing of design documents or the signing and electronic transmission of any other documents; or 3) to comply with the notice requirements of Paragraph 18.01 of the General Conditions.

2. System Infrastructure for Electronic Document Exchange

- a. Each party will provide hardware, operating system(s) software, internet, e-mail, and large file transfer functions ("System Infrastructure") at its own cost and sufficient for complying with the EDP requirements. With the exception of minimum standards set forth in this EDP, and any explicit system requirements specified by attachment to this EDP, it is the obligation of each party to determine, for itself, its own System Infrastructure.
 - 1) The maximum size of an email attachment for exchange of Electronic Documents under this EDP is 5 MB. Attachments larger than that may be exchanged using large file transfer functions or physical media.
 - 2) Each Party assumes full and complete responsibility for any and all of its own costs, delays, deficiencies, and errors associated with converting, translating, updating, verifying, licensing, or otherwise enabling its System Infrastructure, including operating systems and software, for use with respect to this EDP.
- b. Each party is responsible for its own system operations, security, back-up, archiving, audits, printing resources, and other Information Technology ("IT") for

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maintaining operations of its System Infrastructure during the Project, including coordination with the party's individual(s) or entity responsible for managing its System Infrastructure and capable of addressing routine communications and other IT issues affecting the exchange of Electronic Documents.

- c. Each party will operate and maintain industry-standard, industry-accepted, ISO standard, commercial-grade security software and systems that are intended to protect the other party from: software viruses and other malicious software like worms, trojans, adware; data breaches; loss of confidentiality; and other threats in the transmission to or storage of information from the other parties, including transmission of Electronic Documents by physical media such as CD/DVD/flash drive/hard drive. To the extent that a party maintains and operates such security software and systems, it shall not be liable to the other party for any breach of system security.
- d. In the case of disputes, conflicts, or modifications to the EDP required to address issues affecting System Infrastructure, the parties shall cooperatively resolve the issues; but, failing resolution, the Owner is authorized to make and require reasonable and necessary changes to the EDP to effectuate its original intent. If the changes cause additional cost or time to Contractor, not reasonably anticipated under the original EDP, Contractor may seek an adjustment in price or time under the appropriate process in the Contract.
- e. Each party is responsible for its own back-up and archive of documents sent and received during the term of the contract under this EDP, unless this EDP establishes a Project document archive, either as part of a mandatory Project website or other communications protocol, upon which the parties may rely for document archiving during the specified term of operation of such Project document archive. Further, each party remains solely responsible for its own post-Project back-up and archive of Project documents after the term of the Contract, or after termination of the Project document archive, if one is established, for as long as required by the Contract and as each party deems necessary for its own purposes.
- f. If a receiving party receives an obviously corrupted, damaged, or unreadable Electronic Document, the receiving party will advise the sending party of the incomplete transmission.
- g. The parties will bring any non-conforming Electronic Documents into compliance with the EDP. The parties will attempt to complete a successful transmission of the Electronic Document or use an alternative delivery method to complete the communication.

C. Software Requirements for Electronic Document Exchange; Limitations

- 1. Each party will acquire the software and software licenses necessary to create and transmit Electronic Documents and to read and to use any Electronic Documents received from the other party (and if relevant from third parties), using the software formats required in this section of the EDP.
 - a. Prior to using any updated version of the software required in this section for sending Electronic Documents to the other party, the originating party will first

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notify and receive concurrence from the other party for use of the updated version or adjust its transmission to comply with this EDP.

2. The parties agree not to intentionally edit, reverse engineer, decrypt, remove security or encryption features, or convert to another format for modification purposes any Electronic Document or information contained therein that was transmitted in a software data format, including Portable Document Format (PDF), intended by sender not to be modified, unless the receiving party obtains the permission of the sending party or is citing or quoting excerpts of the Electronic Document for Project purposes.
3. Software and data formats for exchange of Electronic Documents will conform to the requirements set forth in Exhibit A to this EDP, including software versions, if listed.

D. Requests by Contractor for Electronic Documents in Other Formats

1. Release of any Electronic Document versions of the Project documents in formats other than those identified in the Electronic Documents Protocol (if any) or elsewhere in the Contract will be at the sole discretion of the Owner.
2. To extent determined by Owner, in its sole discretion, to be prudent and necessary, release of Electronic Documents versions of Project documents and other Project information requested by Contractor ("Request") in formats other than those identified in the Electronic Documents Protocol (if any) or elsewhere in the Contract will be subject to the provisions of the Owner's response to the Request, and to the following conditions to which Contractor agrees:
 - a. The content included in the Electronic Documents created by Landscape Architect and covered by the Request was prepared by Landscape Architect as an internal working document for Landscape Architect's purposes solely and is being provided to Contractor on an "AS IS" basis without any warranties of any kind, including, but not limited to any implied warranties of fitness for any purpose. As such, Contractor is advised and acknowledges that the content may not be suitable for Contractor's application or may require substantial modification and independent verification by Contractor. The content may include limited resolution of models, not-to-scale schematic representations and symbols, use of notes to convey design concepts in lieu of accurate graphics, approximations, graphical simplifications, undocumented intermediate revisions, and other devices that may affect subsequent reuse.
 - b. Electronic Documents containing text, graphics, metadata, or other types of data that are provided by Landscape Architect to Contractor under the request are only for convenience of Contractor. Any conclusion or information obtained or derived from such data will be at the Contractor's sole risk and the Contractor waives any claims against Landscape Architect, Engineer or Owner arising from use of data in Electronic Documents covered by the Request.
 - c. Contractor shall indemnify and hold harmless Owner and Landscape Architect and their subconsultants from all claims, damages, losses, and expenses, including attorneys' fees and defense costs arising out of or resulting from Contractor's use, adaptation, or distribution of any Electronic Documents provided under the Request.

- d. Contractor agrees not to sell, copy, transfer, forward, give away or otherwise distribute this information (in source or modified file format) to any third party without the direct written authorization of Landscape Architect, unless such distribution is specifically identified in the Request and is limited to Contractor's subcontractors. Contractor warrants that subsequent use by Contractor's subcontractors complies with all terms of the Contract Documents and Owner's response to Request.
3. In the event that Owner elects to provide or directs the Landscape Architect to provide to Contractor any Contractor-requested Electronic Document versions of Project information that is not explicitly identified in the Contract Documents as being available to Contractor, the Owner shall be reimbursed by Contractor on an hourly basis (at \$150 per hour) for any Landscape Architecting costs necessary to create or otherwise prepare the data in a manner deemed appropriate by Landscape Architect.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 Intent

No Supplementary Conditions in this Article.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.03 Reference Points

- A. The OWNER will provide engineering surveys to establish reference points for construction.

4.05 Delays in Contractor's Progress

- 5. Weather-Related Delays
 - a. If "abnormal weather conditions" as set forth in Paragraph 4.05.C.2 of the General Conditions are the basis for a request for an equitable adjustment in the Contract Times, such request must be documented by data substantiating each of the following: 1) that weather conditions were abnormal for the period of time in which the delay occurred, 2) that such weather conditions could not have been reasonably anticipated, and 3) that such weather conditions had an adverse effect on the Work as scheduled.
 - b. The existence of abnormal weather conditions will be determined on a month-by-month basis in accordance with the following:
 - 1) Contractor shall anticipate the number of foreseeable bad weather days per month indicated in the Table 1803-2—Anticipated Workdays Lost Due to Weather in MnDOT Standard Specifications for Construction. The days in Table 1803-2 are cumulative and the number of allowable bad weather days will be determined by totaling the monthly number of days throughout the specified Contract Time. The days in Table 1803-2 will prorated when Contract Time starts or ends mid-month.
 - 2) Workdays lost to inclement weather exceeding the allowable number, established as described in Paragraph 4.05.C.2 will be considered as "abnormal weather conditions." The existence of abnormal weather conditions will not relieve Contractor of the obligation to demonstrate and

document that delays caused by abnormal weather are specific to the planned work activities or that such activities thus delayed were on Contractor’s then-current Progress Schedule’s critical path for the Project.

- 3) The Owner will not consider weekends or holidays, as eligible for extensions of Contract Time due to weather unless the Landscape Architect or Owner directs the Contractor to work those days, or the Contractor’s accepted progress schedule in place at the time the delay occurred indicated that the Contractor intended to perform Critical Path Work on those days.

ARTICLE 5—SITE, SUBSURFACE AND PHYSICAL CONDITIONS, HAZARDOUS ENVIRONMENTAL CONDITIONS

5.03 Subsurface and Physical Conditions

- E. The following table lists the reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data, and specifically identifies the Technical Data in the report upon which Contractor may rely:

Report Title	Date of Report	Technical Data
Geotechnical Evaluation Report 2025 – 2026 Gorman Park Improvements	8/9/2024	Data contained in boring logs, recorded measurements of subsurface water levels, and other factual, objective information regarding conditions at the Site.

- F. The following table lists the drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data, and specifically identifies the Technical Data upon which Contractor may rely:

Drawings Title	Date of Drawings	Technical Data
There are no drawings the Contractor may rely.		

- G. Contractor may examine copies of reports and drawings identified in SC-5.03.E and SC-5.03.F that were not included with the Bidding Documents at 1960 Premier Drive, Mankato, MN 56001, (507) 625-4171, fax (507) 625-4177 during regular business hours or may request copies from Landscape Architect.

5.06 Hazardous Environmental Conditions

4. The following table lists the reports known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and the Technical Data (if any) upon which Contractor may rely:

Report Title	Date of Report	Technical Data
There are no reports the Contractor may rely.		

5. The following table lists the drawings known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and Technical Data (if any) contained in such Drawings upon which Contractor may rely:

Drawings Title	Date of Drawings	Technical Data
There are no drawings the Contractor may rely.		

5.07 – *Inadvertent Discoveries*

- A. The contractor is cautioned that disturbance of historical objects may be subject to criminal or civil penalties.
- B. If potential historic objects are found within the project limits, the Contractor shall:
 - 1. Suspend operations in the immediate area of the discovery and protect from construction operations.
 - 2. Notify the Landscape Architect of the presence of potential historical objects.
 - 3. The Contractor shall not perform work that the Contractor considers Extra Work without the written approval of the Landscape Architect.
 - 4. Work may be restricted or suspended in the Immediate area of the historical objects for a period not to exceed 72 hours without a Contractor claim for damages. No restrictions or suspension shall be imposed over 72 hours unless agreed by the Contractor and the Owner in writing.

ARTICLE 6—BONDS AND INSURANCE

6.01 Performance, Payment, and Other Bonds

- 1. Required Performance Bond Form: The performance bond that Contractor furnishes will be in the form of EJCDC® C 610, Performance Bond (2010, 2013, or 2018 edition).
- 2. Required Payment Bond Form: The payment bond that Contractor furnishes will be in the form of EJCDC® C 615, Payment Bond (2010, 2013, or 2018 edition).
- 1. The correction period specified as one year after the date of Substantial Completion in Paragraph 15.08.A of the General Conditions is hereby revised to be 2 years after Substantial Completion.
- 2. After Substantial Completion, Contractor shall furnish a warranty bond issued in the form of EJCDC® C 612, Warranty Bond (2018). The warranty bond must be in a bond amount of 10 percent of the final Contract Price. The warranty bond period will extend to a date 2 years after Substantial Completion of the Work. Contractor shall deliver the fully executed warranty bond to Owner prior to final payment, and in any event no later than 11 months after Substantial Completion.
- 3. The warranty bond must be issued by the same surety that issues the performance bond required under Paragraph 6.01.A of the General Conditions.

6.02 Insurance—General Provisions

- 1. Contractor may obtain worker’s compensation insurance from an insurance company that has not been rated by A.M. Best, provided that such company (a) is domiciled in the state in which the Project is located, (b) is certified or authorized as a worker’s compensation insurance provider by the appropriate state agency, and (c) has been accepted to provide worker’s compensation insurance for similar projects by the state within the last 12 months.

6.03 Contractor's Insurance

- D. Other Additional Insureds: As a supplement to the provisions of Paragraph 6.03.C of the General Conditions, the commercial general liability, automobile liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies must include as additional insureds (in addition to Owner, Engineer, and Landscape Architect) the following: None
- E. Workers' Compensation and Employer's Liability: Contractor shall purchase and maintain workers' compensation and employer's liability insurance, including, as applicable, United States Longshoreman and Harbor Workers' Compensation Act, Jones Act, stop-gap employer's liability coverage for monopolistic states, and foreign voluntary workers' compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

Workers' Compensation and Related Policies	Policy limits of not less than:
Workers' Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory
Jones Act (if applicable)	
Bodily injury by accident—each accident	Not Applicable
Bodily injury by disease—aggregate	Not Applicable
Employer's Liability	
Each accident	\$1,000,000.00
Each employee	\$1,000,000.00
Policy limit	\$1,000,000.00
Stop-gap Liability Coverage	
For work performed in monopolistic states, stop-gap liability coverage must be endorsed to either the worker's compensation or commercial general liability policy with a minimum limit of:	Not Applicable

- F. Commercial General Liability—Claims Covered: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:
 1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,
 2. damages insured by reasonably available personal injury liability coverage, and
 3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- G. Commercial General Liability—Form and Content: Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:
 1. Products and completed operations coverage.

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- a. Such insurance must be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
2. Blanket contractual liability coverage, including but not limited to coverage of Contractor’s contractual indemnity obligations in Paragraph 7.18.
 3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
 4. Underground, explosion, and collapse coverage.
 5. Personal injury coverage.
 6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.
 7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 “Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured” or its equivalent.
- H. Commercial General Liability—Excluded Content: The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:
1. Any modification of the standard definition of “insured contract” (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
 2. Any exclusion for water intrusion or water damage.
 3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
 4. Any exclusion of coverage relating to earth subsidence or movement.
 5. Any exclusion for the insured’s vicarious liability, strict liability, or statutory liability (other than worker’s compensation).
 6. Any limitation or exclusion based on the nature of Contractor’s work.
 7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.
- I. Commercial General Liability—Minimum Policy Limits

Commercial General Liability	Policy limits of not less than:
General Aggregate	\$2,000,000.00
Products—Completed Operations Aggregate	\$2,000,000.00
Personal and Advertising Injury	\$1,500,000.00
Bodily Injury and Property Damage—Each Occurrence	\$1,500,000.00

- J. Automobile Liability: Contractor shall purchase and maintain automobile liability insurance for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy must be written on an occurrence basis.

Automobile Liability	Policy limits of not less than:
Bodily Injury	
Each Person	\$1,000,000.00
Each Accident	\$1,000,000.00
Property Damage	
Each Accident	\$1,000,000.00
[or]	
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	\$1,000,000.00

- K. Umbrella or Excess Liability: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer’s liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	Not Applicable
General Aggregate	Not Applicable

- L. Using Umbrella or Excess Liability Insurance to Meet CGL and Other Policy Limit Requirements: Contractor may meet the policy limits specified for employer’s liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policy’s policy limits and partial attribution of the policy limits of an umbrella or excess liability policy that is at least as broad in coverage as that of the underlying policy, as specified herein. If such umbrella or excess liability policy was required under this Contract, at a specified minimum policy limit, such umbrella or excess policy must retain a minimum limit of \$0 after accounting for partial attribution of its limits to underlying policies, as allowed above.

- M. Contractor’s Pollution Liability Insurance: Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor’s operations and completed operations. This insurance must be maintained for no less than three years after final completion.

Contractor’s Pollution Liability	Policy limits of not less than:
Each Occurrence/Claim	Not Applicable
General Aggregate	Not Applicable

- N. Contractor’s Professional Liability Insurance: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance must cover negligent acts, errors, or omissions in the performance of professional design or related services by the insured or

others for whom the insured is legally liable. The insurance must be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. The retroactive date on the policy must pre-date the commencement of furnishing services on the Project.

Contractor's Professional Liability	Policy limits of not less than:
Each Claim	Not Applicable
Annual Aggregate	Not Applicable

- O. Railroad Protective Liability Insurance: No Supplementary Conditions in this Article.
- P. Unmanned Aerial Vehicle Liability Insurance: No Supplementary Conditions in this Article.
- Q. Other Required Insurance: No Supplementary Conditions in this Article.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.03 Labor; Working Hours

1. Regular working hours will be 7:30 A.M. to 6:00 P.M. Monday - Friday.
2. Owner's legal holidays are: New Year's Day, January 1; Martin Luther King's Birthday, the third Monday in January; Washington's and Lincoln's Birthday, the third Monday in February; Memorial Day, the last Monday in May; Juneteenth, June 19; Independence Day, July 4; Labor Day, the first Monday in September; Christopher Columbus Day, the second Monday in October; Veterans Day, November 11; Thanksgiving Day, the fourth Thursday in November; and Christmas Day, December 25.
3. When a legal holiday occurs on Sunday, the subsequent Monday shall be the observed holiday. When a legal holiday occurs on Saturday, the preceding Friday shall be the observed holiday.

7.12 Record Documents

- A. Supplementary sketches and photographs shall be included to clearly indicate all work as constructed.
- B. All manholes, watermain bends, and valves shall be located with tie-off dimensions to known items on the plans or in the field to enable the Contractor or City personnel to locate these structures for adjustment.
- C. The complete set of the record documents shall be submitted to the Landscape Architect prior to the submittal of the final Application for Payment. Failure of the Contractor to maintain an up-to-date set of record drawings on the project site shall be a reason to withhold payments.

ARTICLE 8—OTHER WORK AT THE SITE

No Changes

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.13 Owner's Site Representative

- A. Owner will furnish an "Owner's Site Representative" to represent Owner at the Site and assist Owner in observing the progress and quality of the Work. The Owner's Site

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Representative is not Landscape Architect's consultant, agent, or employee. The authority and responsibilities of Owner's Site Representative follow: underground utility construction

ARTICLE 10—LANDSCAPE ARCHITECT'S STATUS DURING CONSTRUCTION

10.13 Resident Project Representative

1. On this Project, by agreement with the Owner, the Landscape Architect will not furnish a Resident Project Representative to represent Landscape Architect at the Site or assist Landscape Architect in observing the progress and quality of the Work.

ARTICLE 11—CHANGES TO THE CONTRACT

- C. In complying with any Minnesota Governmental Data Practices Act (MGDPA) request, Contractor will be reimbursed by Change Order only for its reasonable direct labor and other direct expenses, without mark-up or increase in 11.07.C. Fee; but only to the extent that the request is not due to a negligent, intentional, or willful act or omission by the Contractor or other failure to comply with its obligations under this contract.

ARTICLE 12—CLAIMS

No Supplementary Conditions in this Article.

ARTICLE 13—COST OF WORK; ALLOWANCES, UNIT PRICE WORK

- a. For purposes of this paragraph, "small tools and hand tools" means any tool or equipment whose current price if it were purchased new at retail would be less than \$500.

13.03 Unit Price Work

E. Adjustments in Unit Price

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the extended price of a particular item of Unit Price Work amounts to five percent or more of the Contract Price and the variation in the quantity of that particular item of Unit Price Work actually furnished or performed by Contractor differs by more than twenty percent from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

No Supplementary Conditions in this Article.

ARTICLE 15—PAYMENTS TO CONTRACTOR, SET OFFS; COMPLETIONS; CORRECTION PERIOD

1. The time period for payment shall be in accordance with the Agreement.
 - m. All out-of-state contractors shall comply with all State of Minnesota surety deposit requirements. The OWNER may withhold an additional sum of 8 percent of the amount due the CONTRACTOR from each payment and forward it to the Department of Revenue until the CONTRACTOR's state tax obligations are considered fulfilled unless the CONTRACTOR can show reason for exemption. Exemption will be granted provided the out-of-state CONTRACTOR meets the exemption guidelines established for the Minnesota Department of Revenue. All necessary forms may be obtained from the Minnesota Department of Revenue, Mail Station 4450, St. Paul, Minnesota 55146-4450, or phone 1-800-657-3777 or online at:
<http://www.revenue.state.mn.us/businesses/withholding/Pages/Forms.aspx>.

- F. For contracts in which the Contract Price is based on the Cost of Work, if Owner determines that progress payments made to date substantially exceed the actual progress of the Work (as measured by reference to the Schedule of Values), or present a potential conflict with the Guaranteed Maximum Price, then Owner may require that Contractor prepare and submit a plan for the remaining anticipated Applications for Payment that will bring payments and progress into closer alignment and take into account the Guaranteed Maximum Price (if any), through reductions in billings, increases in retainage, or other equitable measures. Owner will review the plan, discuss any necessary modifications, and implement the plan as modified for all remaining Applications for Payment.

15.03 Substantial Completion

- A. When Contractor considers the entire Work to be substantially complete Contractor shall notify Owner and Landscape Architect in writing that the entire Work is substantially complete and request that Landscape Architect issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Landscape Architect an initial draft of punch list items to be completed or corrected before final payment.
 1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Landscape Architect, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, will be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under this Article 15.

15.06 Final Payment

4. Final payment will not be made to the CONTRACTOR until a certificate showing that the CONTRACTOR has complied with the provisions of M.S.A. 290.92 requiring withholding of income tax on wages at the source. Said certificate shall be executed by the Commissioner of Revenue. Forms for certification may be obtained from the Commissioner of Revenue, Centennial Building, St. Paul, Minnesota 55145.

15.08 Correction Period

- G. The correction period specified as one year after the date of Substantial Completion in Paragraph 15.08.A of the General Conditions is hereby revised to be the number of years

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set forth in SC-6.01.B.1; or if no such revision has been made in SC-6.01.B, then the correction period is hereby specified to be 2 years after Substantial Completion.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

No Supplementary Conditions in this Article.

ARTICLE 17—FINAL RESOLUTIONS OF DISPUTES

No Supplementary Conditions in this Article.

ARTICLE 18—MISCELLANEOUS

No Supplementary Conditions in this Article.

EXHIBIT A —SOFTWARE REQUIREMENTS FOR ELECTRONIC DOCUMENT EXCHANGE

Item	Electronic Documents	Transmittal Means	Data Format	Note (1)
a.1	General communications, transmittal covers, meeting notices and responses to general information requests for which there is no specific prescribed form.	Email	Email	
a.2	Meeting agendas, meeting minutes, RFI's and responses to RFI's, and Contract forms.	Email w/ Attachment	PDF	(2)
a.3	Contactor's Submittals (Shop Drawings, "or equal" requests, substitution requests, documentation accompanying Sample submittals and other submittals) to Owner and Landscape Architect, and Owner's and Landscape Architect's responses to Contractor's Submittals, Shop Drawings, correspondence, and Applications for Payment.	Email w/ Attachment	PDF	
a.4	Correspondence; milestone and final version Submittals of reports, layouts, Drawings, maps, calculations and spreadsheets, Specifications, Drawings and other Submittals from Contractor to Owner or Landscape Architect and for responses from Landscape Architect and Owner to Contractor regarding Submittals.	Email w/ Attachment or LFE	PDF	
a.5	Layouts and drawings to be submitted to Owner for future use and modification.	Email w/ Attachment or LFE	DWG	
a.6	Correspondence, reports, and Specifications to be submitted to Owner for future word processing use and modification.	Email w/ Attachment or LFE	DOC	
a.7	Spreadsheets and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	EXC	
a.8	Database files and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	DB	
a.9	Construction photographs	Email w/ Attachment or LFE	JPG	(3)
Notes				
(1)	All exchanges and uses of transmitted data are subject to the appropriate provisions of Contract Documents.			
(2)	Transmittal of written notices is governed by Paragraph 18.01 of the General Conditions.			
(3)	All photographs must include location details (latitude and longitude) in their metadata.			
Key				
Email	Standard Email formats (.htm, .rtf, or .txt). Do not use stationery formatting or other features that impair legibility of content on screen or in printed copies			
LFE	Agreed upon Large File Exchange method (FTP, CD, DVD, hard drive)			
PDF	Portable Document Format readable by Adobe® Acrobat Reader Version.			
DWG	Autodesk® AutoCAD .dwg format Version.			
DOC	Microsoft® Word .docx format Version.			
EXC	Microsoft® Excel .xls or .xml format Version.			
DB	Microsoft® Access .mdb format Version.			

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SECTION 01 21 16 – CONTINGENCY ALLOWANCES

PART 1 - GENERAL

1.1 METHOD OF MEASUREMENT AND PAYMENT

- A. The construction allowances bid item shall be used at the Architect or owner’s discretion to pay for minor changes that are compatible with the design concept of the completed project. Compensation will be made as a percentage of the LUMP SUM price bid.
1. No payment shall be made for construction allowances unless the following conditions are met:
 - a. The contractor shall submit a written request for approval of the construction allowances prior to the work being undertaken by the contractor, if applicable.
 - b. The work is authorized in writing by an approved field order.
 - c. The work is authorized in writing by the Architect and Owner.
 2. Costs eligible for payment may include a mutually acceptable contractor markup, however; markups shall not include costs for performance and payment bonds.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 41 00 - REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Applicable codes and standards referred to in these specifications shall establish minimum requirements and shall be superseded by more stringent requirements of drawings and specifications when and where they occur.
- B. Any conflicts between specifications and applicable codes and standards shall be referred to the Architect.

1.2 SUBMITTALS

- A. The Contractor shall submit copies of Safety Data Sheets (SDSs) for each material on site to the Architect.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. All equipment furnished and installed under the contract shall be designed, fabricated, assembled, installed, and placed into service. The equipment will conform to the applicable provisions of the Federal and State Safety and Health Standards, including but not limited to Federal Occupational Safety and Health Regulations for Construction; the Division of Environmental Health, Minnesota Department of Health; the Minnesota Pollution Control Agency; the Department of Natural Resources; the Minnesota Department of Transportation, Division of Highways; the Minnesota Industrial Commission and ordinances of the City that apply to this work.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. All construction methods and tools shall comply with commonly accepted standards for safety and health of personnel engaged on construction, including but not limited to Federal Occupational Safety and Health Regulations for Construction; the Division of Environmental Health, Minnesota Department of Health; the Minnesota Pollution Control Agency; the Department of Natural Resources; the Minnesota Department of Transportation, Division of Highways; the Minnesota Industrial Commission and ordinances of the City that apply to this work.

END OF SECTION

SECTION 01 41 26 - PERMIT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Any conflicts between specifications and permits for this project shall be referred to the Architect.

1.2 PERMITS OBTAINED BY OWNER

- A. The Owner has applied for the following permits from appropriate authorities. It is anticipated that permission to proceed will be authorized prior to execution of Contract. The Contractor shall perform all work and conduct itself in full accordance with the requirements of the applicable permit:

- 1. Minnesota Department of Health (MDH) - Watermain Plan Review.
- 2. DOLI plumbing plan review.

- B. The Contractor shall be responsible for meeting any bonding or insurance requirements which may be required as a condition to any permit, listed above.

1.3 PERMITS OBTAINED BY CONTRACTOR

- A. The Contractor shall secure and pay the cost of any other permits not mentioned above, which may be required for work within the project limits including but not limited to:

- 1. Minnesota Pollution Control Agency (MPCA) - General Storm Water Permit for Construction Activity (MN R100001)
- 2. City of Saint Peter – Work within Right-of-Way Permit

- B. The Contractor shall identify, secure, and pay for any required permission, fee, or permit for work not within the project limits, but which may be considered a connected action. A connected action shall be defined as including but not limited to:

- 1. Obtaining borrow for the project,
- 2. Disposal of any waste product or excess material resulting from the project, and
- 3. Any action by the Contractor that is closely related by proximity in location and time to the project that may be perceived by the public or any regulatory body to be part of the project.

1.4 SUBMITTALS

- A. Contractor shall provide a draft copy of all notifications, submittals, and permit applications to the Architect for review a minimum of 5-business days prior to submittal to any regulatory or permitting agency.

- B. Contractor shall copy the Architect on all notifications, submittals, and permit applications at the time of submittal to the agency or permitting authority.

- C. If requested by the Owner, the Contractor shall provide copies of permits and/or permissions acquired for work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 42 19 - REFERENCE STANDARDS

PART 1 - GENERAL

- A. The references listed in this section are not all inclusive. There may be other references in individual specification sections that are not listed in this Section.
- B. Portions of referenced specifications not specifically affected by the supplemented information of modification shall remain in effect as originally written.
- C. It is the Contractor's responsibility to have these, and all other referenced specifications listed in individual Sections available onsite and to be familiar with them.

1.2 ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE (EJCDC)

- A. Documents with the EJCDC copyright notice in the footer are used in this Project Manual under a licensing agreement with EJCDC.

1.3 SOIL DISTURBING ACTIVITIES

- A. Minnesota Pollution Control Agency (MPCA) - General Storm Water Permit for Construction Activity (MN R100001) in force at the day of bid: <http://www.pca.state.mn.us/water/stormwater/stormwater-c.html>

1.4 WATERMAIN, SANITARY SEWER AND STORM SEWER CONSTRUCTION

- A. "Construction Standard Specifications 2023" as published by the City Engineers Association of Minnesota: <http://www.ceam.org>
- B. American Water Works Association (AWWA) Standards: <http://www.awwa.org/>

1.5 GRADING, STREET AND SURFACE IMPROVEMENTS

- A. All of Divisions II and III, and any specifically referenced Division I sections of the Minnesota Department of Transportation (MnDOT), "MnDOT Standard Specifications for Construction 2020 edition", together with all the Supplemental Specifications in force 30 calendar days prior to bid date: <http://www.dot.state.mn.us/pre-letting/spec/>
- B. MnDOT Technical Memoranda in force 30 calendar days prior to bid date and referencing the use of English units of measure: <http://www.dot.state.mn.us/design/tools/index.html>
- C. MnDOT Standard Plans: <http://standardplans.dot.state.mn.us/>
- D. MnDOT Standard Details: <http://standardplates.dot.state.mn.us/>
- E. Whenever the word "Contracting Authority," "Department" or "Owner" is used in the sense of ownership as part of any of the MnDOT Documents, it shall mean Owner as defined in the Agreement.

1.6 TRAFFIC CONTROL

- A. The Minnesota Manual of Uniform Traffic Control Devices (MMUTCD) shall apply to this project and is available at: <http://www.dot.state.mn.us/trafficeng/publ/mutcd/>.
- B. The MnDOT's Temporary Traffic Control Zone Layouts Field available at: <http://www.dot.state.mn.us/trafficeng/publ/fieldmanual/>.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

- A. The Contractor shall always have access to the reference documents at the site during the construction either in paper or digital format.

END OF SECTION

SECTION 01 45 00 - QUALITY CONTROL

PART 1 - GENERAL

1.1 SCOPE OF TESTS

- A. All materials, equipment, installation, and workmanship included in this contract, if required by the Architect, shall be tested and inspected to prove compliance with the contract requirements.
- B. All tests and inspections shall be completed under the direct supervision of a licensed professional engineer. All tests and inspections shall be the responsibility as identified in the individual sections of these specifications and shall be reported directly to the Owner and Architect.
- C. No tests specified herein shall be applied until the item to be tested has been inspected and approval given for the application of such tests.
- D. Tests and inspections shall include all those specified in the individual sections and shall be part of the Lump Sum bid price.
- E. Tests and inspection, unless otherwise specified or accepted, shall be in accordance with the recognized standards of the industry.
- F. Soil compaction testing performed by the Owner is deemed to be for the convenience of the Owner for documentation of the progress and performance of the work. Soil compaction testing results will be made available to the Contractor. However, the Owner and Architect make no representations that the number of tests taken will be sufficient to accurately characterize the condition of any trench, and the Contractor shall take any supplemental test it deems necessary to monitor its own performance. The Owner may, at its discretion, eliminate soil and compaction testing on any part or the entire project. The presence or absence of soil and compaction testing or the approval of the results thereof shall in no way reduce the Contractor's obligation to correct trench settlement as described in these Special Provisions.

1.2 FINAL TESTING AND START-UP

- A. If, under test, any portion of the work fails to fulfill the contract requirements and is altered, renewed or replaced, tests on that portion so altered, removed, replaced, together with all other portions of the work as are affected thereby, shall, if so required by the Architect, be repeated within reasonable time and in accordance with the specified conditions and the Contractor shall pay to the Owner all reasonable expenses incurred by the Owner as a result of the carrying out of such tests.

1.3 TESTING AND LABORATORY SERVICES

- A. Independent Testing Laboratory
 - 1. Where in the individual sections of this Specification, tests or inspections are required to be furnished by the Contractor by an independent testing laboratory, the Contractor shall employ and arrange for, at its expense, the services of an approved independent testing laboratory satisfactory to the Architect to perform the testing utilizing recognized standard procedures and criteria.
- B. Reports and Certificates
 - 1. The Contractor shall submit reports and certificates of all inspections and tests to the Architect in duplicate. The reports and certificates become the property of the Owner.
- C. Sample Materials
 - 1. The Contractor shall furnish all sample materials required for these tests and shall deliver the same without charge to the testing laboratory or other designated agency when and where directed by them.
- D. Additional Tests
 - 1. In addition to those tests required by the individual technical specifications and/or referenced specifications:
 - a. Additional tests required beyond those required under this specification may be ordered by the Architect to settle disagreements with the Contractor regarding quality of work done. If the work is defective, the Contractor shall pay all costs of the additional tests and shall correct the work. If the work is satisfactory, the Owner will pay for the additional tests.
 - b. The Owner may perform televised inspection of any and/or all underground construction included in this project, at its own expense, at any time prior to final payment. All deficiencies discovered in the

course of such investigation shall be corrected at the Contractor's expense and, the Owner's satisfaction, prior to final payment.

1.4 ARCHITECT'S REPRESENTATIVES AND TESTING

- A. The Architect may provide a Resident Project Representative (RPR) to ascertain that the work is accomplished properly and in accordance with the plans and specifications. The RPR shall have full access to the work and shall be given full cooperation. The RPR shall have the authority, subject to the final decision of the Architect, to reject any defective work or material. The RPR shall have no authority to permit any deviation from the plans and specifications except on written order from the Architect.
- B. The presence of the Architect or any RPRs, however, shall not relieve the Contractor of the responsibility for the proper execution of the work in accordance with all requirements of the Contract Documents. Compliance is a duty of the Contractor, and said duty shall not be avoided by any act or omission on the part of the Architect or any RPRs.

1.5 SITE INVESTIGATION AND CONTROL

- A. The Contractor shall verify all dimensions in the field and shall check field conditions continuously during construction. The Contractor shall be solely responsible for any inaccuracies built into the work due to its failure to comply with this requirement.
- B. The Contractor shall inspect related and appurtenant work and shall report in writing to the Architect any conditions, which will prevent proper completion of the work. Failure to report any such conditions shall constitute acceptance of all site conditions, and any required removal, repair or replacement caused by unsuitable conditions shall be performed by the Contractor at its sole cost and expense.

1.6 RIGHT OF REJECTION

- A. The Architect, acting for the Owner, shall have the right, at all time and places, to reject any articles or materials to be furnished hereunder which in any respect, fail to meet the requirements of these specifications, regardless of whether the defects in such articles or materials are detected at the point of manufacture or after completion of the work at the site. If the Architect or RPR, through an oversight or otherwise, has accepted materials or work which is defective or which is contrary to the specifications, such material, no matter in what stage or condition of manufacture, deliver, or erection, may be rejected by the Architect for the Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 55 17 - HAUL ROUTES AND TEMPORARY ACCESS

PART 1 - GENERAL

1.1 MAINTENANCE

- A. The Contractor shall notify and obtain the approval of the local governmental authority for the use of all haul roads and construction easement areas within the City limits not specifically noted below. The Contractor will be required to deliver new materials and dispose of all excavated material plus removal items only on designated haul roads. This also applies to equipment entering and leaving the project site such as backhoes and front-end loaders.
- B. Allowable city street and project haul roads are described as follows:
 - 1. S Washington Avenue
 - 2. W Grace Street
- C. The Contractor shall confine all operations, ingress and egress to the designated haul roads. The Owner may assess a fee in the amount of \$ 500 per day for each day that the Contractor occupies or travels on non-designated haul roads. The fee shall be in addition to damages assessed against the Contractor to repair damage caused to the roadway.
- D. The Contractor shall maintain and repair any damage to haul roads. Maintenance shall include, but not be limited to, the following: blading, patching, signing, graveling and dust control. This work will be at the Contractor's expense, without any direct compensation being made other than the payment received for Contract items.
- E. The Contractor shall be responsible for all maintenance over backfilled trenches and subgrade during the construction period.

1.2 REFERENCED SPECIFICATION

- A. The following referenced Specifications will apply to this Section:
 - 1. MnDOT 1513, Restrictions on Movement and Storage of Heavy Loads and Equipment.
 - 2. MnDOT 1515, Control of Haul Roads
 - 3. MnDOT 2051, Maintenance and Restoration of Haul Roads.
- B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. Reclaimed bituminous and salvaged aggregate base may be used for temporary access surfacing. No additional compensation shall be granted for the installation, removal and disposal of materials utilized in this way.
- B. If haul routes begin to show signs of distress caused by the Contractor's activities, the Contractor shall reduce the weight of loads carried or completely stop using the distressed route. No direct compensation will be made for load and use restrictions for preserving haul routes.

END OF SECTION

SECTION 01 55 26 - TRAFFIC CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Traffic Control

1. All traffic control methods shall conform to the provisions of the latest edition of the Minnesota Manual of Uniform Traffic Control Devices (MN MUTCD), including its supplements and Part VI, "Field Manual for Temporary Traffic Control Zone Layouts", the "Guide to Establishing Speed Limits in Highway Work Zones", the Minnesota Flagging Handbook, the provisions of MnDOT 1404 and 1710, the Minnesota Standard Signs Manuals Parts I and II, the Traffic Engineering Manual Chapter 8 Appendixes 8-8.02 and 8-8.03, the Traffic Control Layouts/Typical Traffic Control Layouts in the Plans.
2. Prior to construction, the Contractor shall develop a traffic control plan and submit it to the Owner and Architect for approval. The traffic control plan shall provide adequate signage for road work ahead, road work, single-lane traffic, road closed ahead, road closed, traffic detours, sidewalk closed ahead, and sidewalk closures. All roadways adjacent to the project area shall always remain open to 2-way traffic. The intersection of S 5th Street and W Mulberry Street may be temporarily reduced to single-lane traffic for bituminous pavement construction. The Contractor shall perform a flagging operation to allow 2-way traffic to safely use the intersection OR close the intersection and install a detour. The detour plan shall be submitted by the Contractor and approved by the Owner and Architect prior to intersection closure. The intersection previously listed shall not be closed for more than 48 consecutive hours.
3. The Contractor shall furnish, install, maintain and remove all traffic control devices including, but not limited to, construction signs, barricades and barricade weights, traffic marking tape, and warning lights which are needed for the guidance, warning and control of traffic adjacent to and through this project.
4. The Contractor shall provide sufficient surveillance of the traffic control devices to ensure compliance during the entire construction period. The Contractor shall furnish names, addresses, and phone numbers of at least two local individuals capable of immediate response who will be responsible for the site security and traffic control devices to:
 - The Architect
 - The Owner
 - Local Law Enforcement Agencies
5. The Contractor shall respond with sufficient personnel, equipment and/or materials and conduct the required work or be subject to a \$100 per hour deduction from the time of notification for non-attention to project security and safety.
6. The Contractor shall schedule the work to cooperate fully with residential and business property owners abutting the project to minimize the time of restricted access to their property during the construction period. Driveway access to any property adjacent to the construction zone shall be restricted to no more than seven days to allow for curing of the concrete curb and driveway pavement.
7. The cost of maintaining vehicular and pedestrian traffic on temporary aggregate surfaced drives, walkways, including the eventual removal of the aggregate material, shall be considered incidental to traffic control.
8. If any of the above right-of-way requires traffic to be detoured around the construction zone, the Contractor shall prepare the detour route with the appropriate Agency representatives. The Contractor shall provide and maintain all signing and other traffic control required. The affected Agency shall be notified by the Contractor before re-routing traffic. Dust control and road maintenance of the bypass route shall be the Contractor's responsibility.
9. The Contractor shall be responsible for securing a site for storage of construction equipment and materials.

B. General Construction and Traffic Requirements

1. The parking of Contractor's Vehicles that obstruct any traffic control devices will not be permitted.

1.2 METHOD OF MEASUREMENT AND PAYMENT

1. Measurement and compensation for traffic control shall be included in the LUMP SUM price bid for the project or bidding section.

1.3 SUBMITTALS

- A. Traffic Control – Contact information for (2) local individuals.
- B. Traffic Control plan provided by the Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. The Contractor shall notify the Architect in writing at least 72 hours prior to the start of any construction operation that will necessitate lane closure or internal traffic control signing.
- B. The traffic control devices required along the project corridor shall be delivered and installed prior to the start-up of the work.
- C. The Contractor shall maintain traffic on adjacent roadways at all times.
- D. The Contractor shall monitor and maintain all traffic control devices.
- E. Immediately respond to requests from the Architect to improve or correct the traffic control devices.

END OF SECTION

SECTION 01 56 39 - TEMPORARY TREE AND PLANT PROTECTION

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.

1.2 SUMMARY

- A. This Section includes the protection and trimming of existing trees that interfere with, or are affected by, execution of the Work, whether temporary or permanent construction.
 - 1. Tree & Plant protection fencing
 - 2. Root zone protection
 - 3. Trunk protection
 - 4. Tree protection signage
 - 5. Pruning of existing trees
 - 6. Maintenance of existing trees
- B. Related Sections include the following:
 - 1. Division 01 10 00 "Summary" for limits placed on Contractor's use of the site
 - 2. Division 01 50 00 "Temporary Facilities and Controls" for temporary tree protection
 - 3. Division 31 02 41 13 " Selective Site Demolition" for removal limits of trees, shrubs, and other plantings affected by new construction
 - 4. Division 31 20 00 Section "Earth Moving" for building and utility trench excavation, backfilling, compacting and grading requirements, and soil materials
 - 5. Division 32 Section "Plants" for tree and shrub planting, tree support systems, and soil materials

1.3 REFERENCES:

- A. The following specifications and standards of the organizations and documents listed in this paragraph form a part of the specification to the extent required by the references thereto. In the event that the requirements of the following referenced standards and specification conflict with this specification section the requirements of this specification shall prevail. In the event that the requirements of any of the following referenced standards and specifications conflict with each other the more stringent requirement shall prevail.
 - 1. ANSI A 300 (Part 5) – Standard Practices for Tree, Shrub and other Woody Plant Maintenance, most current editions.
 - 2. Pruning practices shall conform with recommendations “Structural Pruning: A Guide For The Green Industry”; Published by Urban Tree Foundation, Visalia, California; most current edition.
 - 3. Glossary of Arboricultural Terms, International Society of Arboriculture, Champaign Il, most current edition.

1.4 DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape at a height 6 inches above the ground for trees up to and including 4-inch size at this height and as measured at a height of 12 inches above the ground for trees larger than 4-inch size.

- B. Caliper (DBH): Diameter breast height; diameter of a trunk as measured by a diameter tape at a height 54 inches above the ground line for trees with caliper of 8 inches or greater as measured at a height of 12 inches above the ground.
- C. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- D. Tree Protection Zone: Area surrounding individual trees or groups of trees to remain during construction, and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.
- E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Schedule a pre - construction meeting with the Owner's Representative at least seven (7) days before beginning work to review any questions the Contractor may have regarding the work, administrative procedures during construction and project work schedule.
 - 2. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:
 - a. Tree-service firm's personnel, and equipment needed to make progress and avoid delays.
 - b. Arborist's responsibilities.
 - c. Quality-control program.
 - d. Coordination of Work and equipment movement with the locations of protection zones.
 - e. Trenching by hand or with air spade within protection zones.
 - f. Field quality control.
 - 3. Prior to this meeting, mark all trees and plants to remain and or be removed as described in this specification for review and approval by the Owner's Representative.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones.
 - 2. Detail fabrication and assembly of protection-zone fencing and signage.
 - 3. Indicate extent of trenching by hand or with air spade within protection zones.
- C. Samples: 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 manufacturer's standard size made from full-size components.
 - 3. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.

- D. Tree Pruning Schedule: Written schedule from arborist detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
 - 1. Species and size of tree.
 - 2. Location on site plan. Include unique identifier for each.
 - 3. Reason for pruning.
 - 4. Description of pruning to be performed.
 - 5. Description of maintenance following pruning.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For tree service firm and arborist.
- B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- C. Maintenance Recommendations: From arborist, 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 video recordings.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- E. Quality-control program.

1.8 QUALITY ASSURANCE

- A. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of tree protection and trimming.
- B. Arborist Qualifications: An arborist certified by ISA or licensed in the jurisdiction where Project is located.
 - 1. All pruning, branch tie back, tree removal, root pruning, and fertilizing required by this section shall be performed by or under the direct supervision of ISA Certified Arborist Submit aforementioned individual's qualifications for approval by the Owner's Representative
- C. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection zone fencing and signage, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.
- D. Tree Pruning Standard: Comply with ANSI A300 (Part 1), "Tree, Shrub, and Other Woody Plant Maintenance--Standard Practices (Pruning)."

1.9 FIELD CONDITIONS

- A. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.

2. Moving or 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. Backfill Soil: Planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.
- B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
1. Type: Wood and bark chips.
 2. Size Range: 3 inches maximum, 1/2-inch minimum.
 3. Color: Natural.
- C. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements:
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 and 0.177-inch-diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
 - a. Height: 72 inches.
 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 96 inches apart.
 - a. Height: 72 inches.
 - 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 36 inches .
- D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:
1. Text: **as shown on drawings.**
 2. Lettering: 3-inch- high minimum, red characters on white background.

E. MATTING

1. Matting for vehicle and work protection shall be heavy duty matting designed for vehicle loading over tree roots, Alturamat as manufactured by Alturamat, Inc. Franklin, PA 16323 or approved equal.
2. Submit suppliers product data that product meets the requirements for approval.

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. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 TREE AND PLANT PROTECTION AREA: THE TREE AND PLANT PROTECTION AREA IS DEFINED AS ALL AREAS INDICATED ON THE TREE PROTECTION PLAN. WHERE NO LIMIT OF THE TREE AND PLANT PROTECTION AREA IS DEFINED ON THE DRAWINGS, THE LIMIT SHALL BE THE DRIP LINE (OUTER EDGE OF THE BRANCH CROWN) OF EACH TREE.

3.3 PREPARATION

- A. Prior to the preconstruction meeting, layout the limits of the Tree and Plant Protection Area and then alignments of required Tree and Plant Protection Fencing and root pruning. Obtain the Owner's Representative's approval of the limits of the protection area and the alignment of all fencing and root pruning.
- B. Flag all trees and shrubs to be removed by wrapping orange plastic ribbon around the trunk and obtain the Owner's Representative's approval of all trees and shrubs to be removed prior to the start of tree and shrub removal. After approval, mark all trees and shrubs to be removed with orange paint in a band completely around the base of the tree or shrub 4.5 feet above the ground.
- C. Flag all trees and shrubs to remain with white plastic ribbon tied completely around the trunk or each tree and on a prominent branch for each shrub. Obtain the Owner's Representative's approval of all trees and shrubs to be remain prior to the start of tree and shrub removal.
- D. Prior to any construction activity at the site including utility work, grading, storage of materials, or installation of temporary construction facilities, install all tree protection fencing, Filter Fabric, silt fence, tree protection signs, Geogrid, Mulch and or Wood Chips as shown on the drawings.

3.4 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 from easily entering protected areas 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 F567 and with manufacturer's written instructions.

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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 acceptable to Architect.
 3. Access Gates: 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-zone fencing and signage in good condition as acceptable to Architect 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.
- D. 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.
- E. Do not store construction materials, debris, or excavated material inside tree protection zones. Do not permit vehicles or foot traffic within tree protection zones; prevent soil compaction over root systems.
- F. Do not allow fires within tree protection zones.
- G. Maintain protection zones free of weeds and trash.
- 3.5 INSTALLATION OF GEOGRIDS, FILTER FABRIC, MATTING, WOOD CHIPS AND OR MULCH
- A. Install Geogrids, Filter Fabric, matting, Wood Chips and or Mulch in areas and depths shown on the plans and details or as directed by the Owner's representative. In general it is the intent of this specification to provide the following levels of protection:
1. All areas within the Tree and Plant Protection area provide a minimum of 4 inches of Wood Chips or organic Mulch. Do not place mulch within 6 inches of tree trunks.
 2. Areas where foot traffic or storage of lightweight materials is anticipated to be unavoidable provide a layer of Filter Fabric under the 4 inches of Wood Chips or Mulch.
 3. Areas where occasional light vehicle traffic is anticipated to be unavoidable provide a layer of Geogrids under 8 inches of Wood Chips or Mulch.
 4. Areas where heavy vehicle traffic is unavoidable provide a layer of Geogrids under 8 - 12 inches of Wood Chips or Mulch and a layer of matting over the Wood Chips or Mulch.
- B. The Owner's Representative shall approve the appropriate level of protection.
- C. In the above requirements, light vehicle is defined as a track skid steer with a ground pressure of 4 psi or lighter. A heavy vehicle is any vehicle with a tire or track pressure of greater than 4 psi. Lightweight materials are any packaged materials that can be physically moved by hand into the location. Bulk materials such as soil, or aggregate shall never be stored within the Tree and Plant Protection Area.

3.6 PROTECTION:

- A. Protect the Tree and Plant Protection Area at all times from compaction of the soil; damage of any kind to trunks, bark, branches, leaves and roots of all plants; and contamination of the soil, bark or leaves with construction materials, debris, silt, fuels, oils, and any chemicals substance. Notify the Owner's Representative of any spills, compaction or damage and take corrective action immediately using methods approved by the Owner's Representative.

3.7 GENERAL REQUIREMENTS AND LIMITATIONS FOR OPERATIONS WITHIN THE TREE AND PLANT PROTECTION AREA:

- A. The Contractor shall not engage in any construction activity within the Tree and Plant Protection Area without the approval of the Owner's Representative including: operating, moving or storing equipment; storing supplies or materials; locating temporary facilities including trailers or portable toilets and shall not permit employees to traverse the area to access adjacent areas of the project or use the area for lunch or any other work breaks. Permitted activity, if any, within the Tree and Plant Protection Area maybe indicated on the drawings along with any required remedial activity as listed below.
- B. In the event that construction activity is unavoidable within the Tree and Plant Protection Area, notify the Owner's Representative and submit a detailed written plan of action for approval. The plan shall include: a statement detailing the reason for the activity including why other areas are not suited; a description of the proposed activity; the time period for the activity, and a list of remedial actions that will reduce the impact on the Tree and Plant Protection Area from the activity. Remedial actions shall include but shall not be limited to the following:
 - 1. In general, demolition and excavation within the drip line of trees and shrubs shall proceed with extreme care either by the use of hand tools, directional boring and or Air Knife excavation where indicated or with other low impact equipment that will not cause damage to the tree, roots or soil.
 - 2. When encountered, exposed roots, 1 inches and larger in diameter shall be worked around in a manner that does not break the outer layer of the root surface (bark). These roots shall be covered in Wood Chips and shall be maintained above permanent wilt point at all times. Roots one inch and larger in diameter shall not be cut with out the approval of the owners representative. Excavation shall be tunneled under these roots without cutting them. In the areas where roots are encountered, work shall be performed and scheduled to close excavations as quickly as possible over exposed roots.
 - 3. Tree branches that interfere with the construction may be tied back or pruned to clear only to the point necessary to complete the work. Other branches shall only be removed when specifically indicated by the Owner's Representative. Tying back or trimming of all branches and the cutting of roots shall be in accordance with accepted arboricultural practices (ANSI A300, part 8) and be performed under supervision of the arborist.
 - 4. Matting: Install temporary matting over the Wood Chips or Mulch to the extent indicated. Do not permit foot traffic, scaffolding or the storage of materials within the Tree and Plant Protection Area to occur off of the temporary matting.
 - 5. Trunk Protection: Protect the trunk of each tree to remain where work is to occur within the dripline of the tree by covering it with layers of burlap and a ring of 8 foot long 2 inch x 6- inch planks loosely banded onto the tree with 3 bands. Staple the bands to the planks as necessary to hold them securely in place. Trunk protection must by kept in place no longer than 12 months. If construction requires work near a particular tree to continue longer than 12 months, the bands shall be inspected every six months and loosened if they are found to have become tight.
 - 6. Air Excavation Tool: If excavation for footings or utilities is required within the Tree and Plant Protection Area, air excavation tool techniques shall be used where practical or as designed on the drawings.
 - a. Remove the Wood Chips from an area approximately 18 inches beyond the limits of the hole or trench to be excavated. Cover the Wood Chips for a distance of not less than 15 feet around the limit of the excavation area with Filter Fabric or plastic sheeting to protect the Wood Chips from silt. Mound the Wood Chips so that the plastic slopes towards the excavation.
 - b. Using a sprinkler or soaker hose, apply water slowly to the area of the excavation for a period of at least 4 hours, approximately 12 hours prior to the work so that the ground water level is at or near field capacity at the beginning of the work. For excavations that go beyond the damp soil, rewet the soil as necessary to keep soil moisture near field capacity.
 - c. Using an air excavation tool specifically designed and manufactured for the intended purpose, and at pressures recommended by the manufacturer of the equipment, fracture the existing soil to the

shape and the depths required. Work at rates and using techniques that do not harm tree roots. Air pressure shall be a maximum of 90-100 psi.

- 1) The air excavation tool shall be "Air-Spade" as manufactured by Concept Engineering Group, Inc., Verona, PA (412) 826-8800, or Air Knife as manufactured by Easy Use Air Tools, Inc. Allison Park, Pa (866) 328-5723 or approved equal.
- d. Using a commercial, high-powered vacuum truck if required, remove the soil from the excavation produced by the Air Knife excavation. The vacuum truck should generally operate simultaneously with the hose operator, such that the soil produced is picked up from the excavation hole, and the exposed roots can be observed and not damaged by the ongoing operation. Do not drive the vacuum truck into the Tree and Plant Protection Area unless the area is protected from compaction as approved in advance by the Owner's Representative.
7. Remove all excavated soil and excavated Wood Chips, and contaminated soil at the end of the excavation.
8. Schedule the work so that foundations or utility work is completed immediately after the excavation. Do not let the roots dry out. Mist the roots several times during the day. If the excavated area must remain open over night, mist the roots and cover the excavation with black plastic.
9. Dispose of all soil in a manner that meets local laws and regulations.
10. Restore soil within the trench as soon as the work is completed. Utilize soil of similar texture to the removed soil and lightly compact with hand tools. Leave soil mounded over the trench to a height of approximately 10% of the trench depth to account for settlement.
11. Restore any Geogrids, Filter Fabric, Wood Chips or Mulch and or matting that was previously required for the area.

3.8 TREE REMOVAL & STUMP GRIDING:

- A. Remove all trees indicated by the drawings and specifications, as requiring removal, in a manner that will not damage adjacent trees or structures or compacts the soil.
- B. Remove trees that are adjacent to trees or structures to remain, in sections, to limit the opportunity of damage to adjacent crowns, trunks, ground plane elements and structures.
- C. Do not drop trees with a single cut unless the tree will fall in an area not included in the Tree and Plant Protection Area. No tree to be removed within 50 feet of the Tree and Plant Protection Area shall be pushed over or up-rooted using a piece of grading equipment.
- D. Protect adjacent paving, soil, trees, shrubs, ground cover plantings and understory plants to remain from damage during all tree removal operations, and from construction operations. Protection shall include the root system, trunk, limbs, and crown from breakage or scarring, and the soil from compaction.
- E. Remove stumps and immediate root plate from existing trees to be removed. Grind trunk bases and large buttress roots to a depth of the largest buttress root or at least 18 inches below the top most roots which ever is less and over the area of three times the diameter of the trunk (DBH).
 1. For trees where the stump will fall under new paved areas, grind roots to a total depth of 18 inches below the existing grade. If the sides of the stump hole still have greater than approximately 20% wood visible, continue grinding operation deeper and or wider until the resulting hole has less than 20% wood. Remove all wood chips produced by the grinding operation and back fill in 8 inch layers with controlled fill of a quality acceptable to the site engineer for fill material under structures, compacted to 95% of the maximum dry density standard proctor. The Owner's Representative shall approve each hole at the end of the grinding operation.
 2. In areas where the tree location is to be a planting bed or lawn, remove all woodchips and backfill stump holes with planting soil as defined in Specification Section Planting Soil, in maximum of 12 inch layers and compact to 80 - 85% of the maximum dry density standard proctor.

3.9 EXCAVATION

- A. Install shoring or other protective support systems to minimize sloping or benching of excavations.
- B. Do not excavate within tree protection zones, unless otherwise indicated.
- C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.
 - 1. 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.
 - 2. 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.
- D. Where utility trenches are required within tree protection zones, tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.
 - 1. Root Pruning: Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with sharp pruning instruments; do not break or chop.]

3.10 REGRADING

- A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade away from trees.
 - 1. Root Pruning: Prune tree roots exposed during grade lowering. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots with sharp pruning instruments; do not break or chop.
- B. Minor Fill: Where existing grade is 6 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.
- C. Moderate Fill: Where existing grade is more than 6 inches but less than 12 inches below elevation of finish grade, place drainage fill, filter fabric, and topsoil on existing grade as follows:
 - 1. Carefully place drainage fill against tree trunk approximately 2 inches above elevation of finish grade and extend not less than 18 inches from tree trunk on all sides. For balance of area within drip-line perimeter, place drainage fill up to 6 inches below elevation of grade.
 - 2. Place filter fabric with edges overlapping 6 inches minimum.
 - 3. Place fill layer of topsoil to finish grade. Do not compact drainage fill or topsoil. Hand grade to required finish elevations.

3.11 ROOT PRUNING

- A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:
 - 1. Clear and excavate trench by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.
 - 2. Cut exposed roots manually by 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.
 - 3. Cut Ends: Do not paint cut root ends.

4. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
 5. Cover exposed roots with burlap and water regularly.
 6. Backfill Immediately according to requirements in Section 312000 "Earth Moving."
- B. Root Pruning outside of Protection Zone (Individual/ General Trees): Where work is to occur within 6' of dripline, prune tree 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 or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.12 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction.
1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
 2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
 3. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
 - a. Type of Pruning: Cleaning and thinning.
- B. Unless otherwise directed by arborist and acceptable to Architect, do not cut tree leaders.
- C. Cut branches with sharp pruning instruments; do not break or chop.
- D. Do not paint or apply sealants to wounds.
- E. Provide subsequent maintenance pruning during Contract period as recommended by arborist.
- F. Chip removed branches and dispose of off-site.

3.13 WATERING

- A. The Contractor shall be fully responsible to ensure that adequate water is provided to all plants to be preserved during the entire construction period. Adequate water is defined to be maintaining soil moisture above the permanent wilt point to a depth of 8 inches or greater.
- B. The Contractor shall adjust the automatic irrigation system, if available, and apply additional water, using hoses or water tanks as required.
- C. Periodically test the moisture content in the soil within the root zone to determine the water content.

3.14 WEED REMOVAL

- A. During the construction period, control any plants that seed in and around the fenced Tree and Plant Protection area at least three times a year.
1. All plants that are not shown on the planting plan or on the Tree and Plant Protection Plan to remain shall be considered as weeds.

- B. At the end of the construction period provide one final weeding of the Tree and Plant Protection Area.

3.15 INSECT AND DISEASE CONTROL

- A. Monitor all plants to remain for disease and insect infestations during the entire construction period. Provide all disease and insect control required to keep the plants in a healthy state using the principles of Integrated Plant Management (IPM). All pesticides shall be applied by a certified pesticide applicator.

3.16 CLEAN-UP

- A. During tree and plant protection work, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.
 - 1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project or on public right of ways and neighboring property.
- B. Once tree protection work is complete, wash all soil from pavements and other structures. Ensure that Mulch is confined to planting beds.
- C. Make all repairs to grades, ruts, and damage to the work or other work at the site.
- D. Remove and dispose of all excess Mulch, Wood Chips, packaging, and other material brought to the site by the Contractor.

3.17 REMOVAL OF FENCING AND OTHER TREE AND PLANT PROTECTION

- A. At the end of the construction period or when requested by the Owner's Representative remove all fencing, Wood Chips or Mulch, Geogrids and Filter Fabric, trunk protection and or any other Tree and Plant Protection material.

3.18 FIELD QUALITY CONTROL

- A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.19 REPAIR AND REPLACEMENT- DAMAGE OR LOSS TO EXISTING PLANTS TO REMAIN

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.
 - 1. Submit details of proposed pruning and repairs.
 - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.
- B. Remove and replace trees & plants indicated to remain that die or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern. Any trees or plants designated to remain and which are damaged by the Contractor shall be replaced in kind by the Contractor at their own expense.

1. Trees shall be replaced with a tree of similar species and of equal size or 6 inch caliper which ever is less. Shrubs shall be replaced with a plant of similar species and equal size or the largest size plants reasonably available which ever is less. Where replacement plants are to be less than the size of the plant that is damaged, the Owner's Representative shall approve the size and quality of the replacement plant.
 - a. All trees and plants shall be installed per the requirements of Specification Section Planting.
 - b. Where Heritage trees or City Code requires more replacement requirements, the more stringent replacement requirements shall govern.
 2. Plants that are damaged shall be considered as requiring replacement or appraisal in the event that the damage affects more than 25 % of the crown, 25% of the trunk circumference, or root protection area, or the tree is damaged in such a manner that the tree could develop into a potential hazard. Trees and shrubs to be replaced shall be removed by the Contractor at his own expense.
 - a. The Owner's Representative may engage an independent arborist to assess any tree or plant that appears to have been damaged to determine their health or condition.
 3. Any tree that is determined to be dead, damaged or potentially hazardous by the Owner's arborist or Landscape Architect and upon the request of the Owner's Representative shall be immediately removed by the Contractor at no additional expense to the owner. Tree removal shall include all clean up of all wood parts and grinding of the stump to a depth sufficient to plant the replacement tree or plant, removal of all chips from the stump site and filling the resulting hole with topsoil.
- C. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 2-inch uniform thickness to remain.
- D. Aerate surface soil, compacted during construction, 10 feet beyond drip line and no closer than 36 inches to tree trunk. Air spade to loosen soil & fertilize with biochar or drill 2-inch-diameter holes a minimum of 12 inches deep at 24 inches o.c. Backfill holes with an equal mix of augered soil and sand.
- E. Any remedial work on damaged existing plants recommended by the Landscape Architect or consulting arborist shall be completed by the Contractor at no cost to the owner. Remedial work shall include but is not limited to: soil compaction remediation and vertical mulching, pruning and or cabling, insect and disease control including injections, compensatory watering, additional mulching, and could include application tree growth regulators (TGR).
- F. Remedial work may extend up to two years following the completion of construction to allow for any requirements of multiple applications or the need to undertake applications at required seasons of the year.
- 3.20 DISPOSAL OF WASTE MATERIALS
- A. Burning is not permitted.
 - B. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property
 1. Deliver all organic material to approved compost facility. Do not landfill.

END OF SECTION 01 56 39

SECTION 01 57 13 – TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment, and performances of all work and services necessary or incidental to stormwater management as indicated on the plans, as specified herein or as directed by the Architect.
- B. The Contractor and Owner shall identify a person(s) knowledgeable and experienced in the application of erosion and sediment control Best Management Practices (BMPs) who will oversee the implementation of the SWPPP.
- C. Minnesota Pollution Control Agency (MPCA) - General Stormwater Permit for Construction Activity (MN R100001)
 1. The **Owner** has developed a **Stormwater Pollution Prevention Plan (SWPPP)** in accordance with Part III (Stormwater Discharge Design Requirements) of the National Pollutant Discharge Elimination System (NPDES)/State Disposal System Permit. The SWPPP is included in the project plans.
 2. As a condition of the Award, the Contractor shall be a co-permittee and assume the role of “**Operator**” under the NPDES Permit.
 3. The Contractor shall initiate the permit and pay the required fee and submit the NPDES Permit using the data shown in the SWPPP located on Plan Sheets.
 4. **Permittee(s)** will ensure that their **SWPPP** meets all terms and conditions of this permit and that their activities do not render ineffective another party’s **Erosion Prevention and Sediment Control BMPs**.
 5. The Contractor shall maintain copies of the SWPPP on the project site at all times and comply with all provisions contained therein, including performing the required inspections of the erosion control devices and maintaining an Inspector’s Log for the MPCA Stormwater Permit. An Inspector’s Log form is attached at the end of this Section.
 6. The Contractor shall be responsible for keeping the on-site SWPPP documents current and updated to reflect changing conditions as construction progresses.
 7. Process Summary:
 - a. Owner issues *Notice of Award* to Contractor.
 - b. The Contractor shall review the SWPPP and may propose changes or a new SWPPP to the Architect and Owner for review, comment, and Authorization. Changes may be recommended by the Contractor, Architect, and/or Owner at any time during the construction period to address changing conditions.
 - (1) The responsibility for SWPPP amendments proposed by the Contractor lies with the Contractor. If the Architect and/or Owner authorize the revisions with no exception taken, such action will not absolve the responsibilities of the Contractor in any way.
 - (2) During the review and modification period, on-site Erosion Control will comply with or exceed the current SWPPP. Pending review by the Architect and/or Owner shall not alleviate the Contractor’s responsibility to install necessary BMPs to address site issues.
 - (3) Once a SWPPP is modified and/or amended, the Contractor shall distribute new copies to the Owner, the Architect, the on-site project supervisor, and the resident project representative.
 - c. The Contractor acknowledges the Notice of Award and provides the Owner with the contact information for the Contractor’s designated SWPPP contact to be used by the Owner for the online Stormwater Permit Application. Required information includes; Name, Title, Business Mailing Address, Phone Number, and Email for the designated individual.
 - d. Within 7 days of acknowledgment of the Notice of Award by the Contractor, the Contractor shall submit the Online Stormwater Permit Application to the MPCA.
 - e. No earth disturbing work will begin until the permit coverage date shown on the Coverage Card issued by the MPCA.
 - f. Work will follow the sequence of major activities outlined in the SWPPP.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for erosion and sediment control will be paid according to the referenced specification or as modified below:
 - 1. Measurement and compensation for erosion and sediment control shall be included in the LUMP SUM price bid for the project or bidding section.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances will not be individually paid. The costs will be included in the LUMP SUM price bid. Such items of work include but are not limited to:
 - 1. Complying with the Minnesota Pollution Control Agency (MPCA) - General Stormwater Permit for Construction Activity (MN R100001)
 - 2. Providing trained Construction SWPPP Manager and BMP Installer.
 - 3. Inspect, maintain, repair, and remove (if necessary) temporary surface stabilization practices throughout the project.
 - 4. Maintaining clean exit areas or roads from the site.
 - 5. Sweeping adjacent streets clean of excess soil.
 - 6. Cleaning storm sewers, drain tiles, and culverts that have been partially or completely obstructed by sediment that originated from the site.
 - 7. Geotextile fabric for rock installation.
 - 8. Geotextile fabric to wrap prefabricated inlet protection devices.
 - 9. Aggregate to anchor and act as a filter for prefabricated inlet protection devices.
 - 10. Aggregate associated with the construction of temporary sediment traps.
 - 11. Emergency erosion control mobilization.
 - 12. Construction, maintenance, and removal of rock construction entrance.
 - 13. Changing the type of inlet protection for different phases of construction.
- C. No additional payment will be made for Erosion Control BMPs necessary to accommodate Contractor phasing of the project.

1.3 SPECIFICATION REFERENCES

- A. The following referenced Specifications will apply to this Section:
 - 1. MnDOT 1717
 - 2. MnDOT 2573
 - 3. MnDOT 2574
 - 4. MnDOT 2575
- B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.4 SUBMITTALS

- A. Notice of Coverage from MPCA.
- B. Contact information and training documentation for Construction SWPPP Manager and BMP Installer.
- C. SWPPP Plan Amendments.
- D. Weekly Erosion and Sediment Control Schedule meeting the requirements of MnDOT 1717.
- E. Site Management Plans meeting the minimum requirements of MnDOT 1717. An updated Site Management Plan will be submitted as needed to reflect changes to:
 - 1. Types and/or Locations of BMPs
 - 2. Material Storage and Spill Response
 - 3. Fueling Plans

4. Locations for Stockpiles, Concrete Washout, and Sanitation Facilities and
5. Project Phasing
- F. PDF copies of all SWPPP Documentation including but not limited to:
 1. Field Copy of the SWPPP. If the Field Copy has been replaced during Construction with an updated SWPPP, a copy of both the final Field Copy and all intermediate copies will be provided.
 2. Inspection Logs including all supporting documents.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. For all materials not specifically discussed below no exceptions to the referenced specification are made.
- B. Bale checks shall not be used.

PART 3 - EXECUTION

3.1 GENERAL

- A. Construction and/or installation of all appropriate erosion & sediment control devices will be completed before any soil disturbing activities.
- B. Before construction, the Contractor shall observe and document the existing stormwater outfall system and discharge area. Sediment deposits not documented before the construction may be assumed to have originated from the project site and be required to be removed and disposed of by the Contractor.
- C. Before construction, the Owner, Architect, and Contractor shall review the project to identify critical areas that could require rapid stabilization during the construction process and develop mitigation and rapid stabilization plans to be incorporated into the SWPPP.

3.2 CONSTRUCTION REQUIREMENTS

- A. The Contractor shall provide one or more trained Construction SWPPP Manager(s). The Construction SWPPP Manager will be knowledgeable and experienced in the application of erosion prevention and sediment control BMPs and will oversee the implementation of the SWPPP, and the installation, inspection, and maintenance of the erosion prevention and sediment control BMPs. A Construction SWPPP Manager must be available for an on-site inspection within 72 hours upon request by the Owner and/or MPCA. Failure to provide a trained Construction SWPPP Manager or failure of the Contractor to rectify the situation within 24 hours of written notice if the provided Construction SWPPP Manager fails to adequately perform the duties of Construction SWPPP Manager may result in the Owner or Architect arranging for the performance of these duties by others.
- B. If the Contractor fails to install and/or perform the appropriate erosion and sediment control practices, as determined by the Architect, the Architect may issue a written order to the Contractor. Failure to perform this work within 24 hours of the written notification may result in the Owner or Architect arranging for the completion of the work by others.
- C. When the Architect determines that the erosion and/or sediment control practices installed by the Contractor have failed, the Contractor shall correct the cause and alleviate all sediment deposition, to the fullest extent possible. If corrective action is not taken promptly, the Architect may issue a written order to the Contractor. Failure to perform this work within 24 hours of notification of non-compliance may result in the Owner or Architect arranging for the completion of the work by others.
- D. A contract deduction will be made equal to the total of all costs incurred by the Owner due to the failure of the Contractor to take corrective action within the timeframe of any written notice of non-compliance. Such costs include but are not limited to labor, materials, equipment, and administrative costs.

3.3 TRAINING

- A. The Contractor shall ensure the individual(s) designated by the Contractor for this project to perform the Construction SWPPP Manager and Installation Supervision duties have been trained in accordance with Minnesota Pollution Control Agency (MPCA) General Stormwater Permit for Construction Activity (MN R100001) training requirements.
- B. Documentation incorporated by the Contractor into the SWPPP must include either:

1. Proof of current certification through the University of Minnesota Erosion and Stormwater Management Certification Program, or
2. Documentation of training satisfactory to the MN Pollution Control Agency showing training is commensurate with the individual's job duties.

3.4 TERMINATION OF COVERAGE

- A. Upon completion of all final stabilization, the Contractor shall provide the Architect with a signed MN MPCA Notice of Termination (NOT) form and a PDF copy of the SWPPP Documentation. Final payment will not be made for the project until the NOT is submitted and the SWPPP Documentation is received.
- B. The NOT form is available on the MPCA website at: <http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/construction-stormwater/index.html>

END OF SECTION

STORMWATER POLLUTION PREVENTION PLAN - INSPECTION LOG

Project Title: Gorman Park, Owner: City of Saint Peter, Permit ID: C000_____

General Contractor: _____

The Contractor is REQUIRED to maintain this record throughout the project.

Inspectors should enter their initials, type, date, and time of the inspection in the blanks provided. After inspecting each shaded area, inspectors should check each box, and make any necessary comments regarding their findings in the blanks provided below and on the back of this sheet.

Refer to the MPCA’s Compliance Guide for Erosion and Sediment Control during the inspection.

Name of Inspector	Type of Inspection		Date and Time of Inspection				Weather		Areas to be Inspected			
	Routine Weekly	24 Hr after a rain event	Month	Day	Year	Time (AM/PM)	Temperature (degrees Fahrenheit)	Rainfall Amount (inches)	All erosion and sediment control BMPs	Temporary Sedimentation Basins	Drainage ditches and other waters of the State	Construction Site Exits
Comments:												
Comments:												
Comments:												
Comments:												

(A digital version of this form is available by request to the Architect)

Technical Specifications

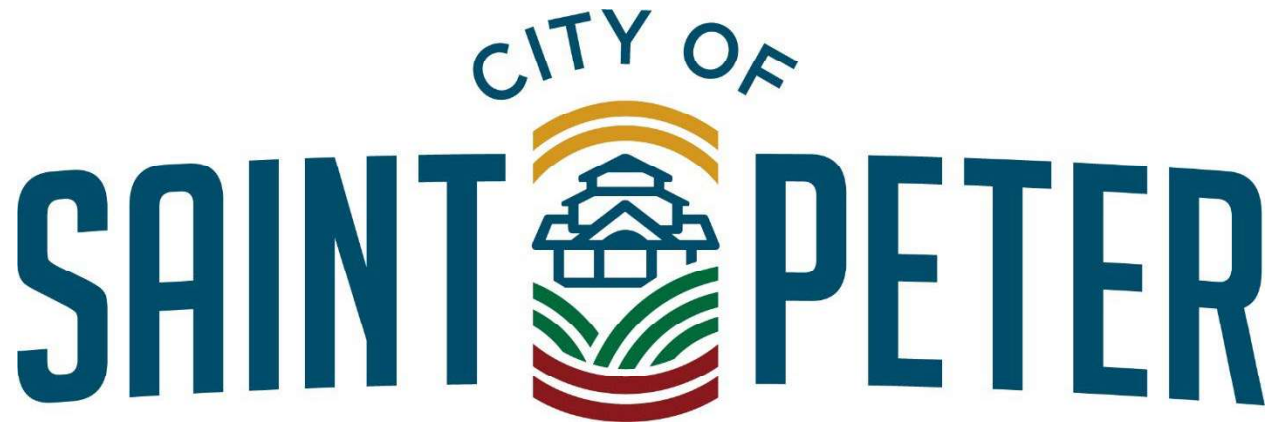
Gorman Park

City of Saint Peter, MN
Saint Peter, MN

City Project No.: 22-150

Bid no.

Date: December 24, 2024



SECTION 02 41 13 – SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the removal of pavement and miscellaneous structures as indicated on the drawings or as specified herein.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. Measurement and compensation for selective site demolition shall be included in the LUMP SUM price bid for the project or bidding section.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances will not be individually paid. The costs will be included in the LUMP SUM price bid. Such items of work include but are not limited to:
 - 1. Saw cutting - bituminous and/or concrete, driveways, sidewalks, pavements, curb & gutter, and other impervious surfaces.
 - 2. Removing storing and reinstalling park signs, street signs or similar structures which must be moved to construct the project. Replacing any damaged lost or stolen signs during construction of this project.
 - 3. Disposal of excess excavated material and debris.
 - 4. Removal and disposal of bituminous or concrete, unless designated for salvaging.
 - 5. Removing, salvaging and storing, or disposing of manhole and catch basin castings.
 - 6. Fees and permits for the disposal of materials.
 - 7. Removal and disposal of existing sanitary sewer pipe, storm sewer pipe, watermain, and service pipes.
 - 8. Bulkheading the ends of existing pipes designated by the Architect to be abandoned in place.
 - 9. Protection from damage of structures or other surface improvements that are not to be removed, and subsequent repair and/or replacement if damaged by Contractor operations.

1.3 SPECIFICATIONS REFERENCES

- A. MnDOT 2104 shall apply to the removal of pavement and miscellaneous structures, except as modified herein.
- B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.4 SUBMITTALS

- A. No submittals for this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. No exception to this section is made.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. Remove existing bituminous, curb and gutter, walks, drives, steps and other specified items where shown on the plans and/or required for the construction of the project.
- B. Saw cut bituminous and concrete surfaces prior to excavation, to produce a clean-cut breakage joint.
- C. Removing, storing and reinstalling park signs, street signs or similar structures which must be moved to construct the project. Replacing any damaged lost or stolen signs during construction of this project.

- D. Dispose of all concrete and bituminous removal items, rubbish and debris outside of the construction zone. It shall be the Contractor's responsibility to secure all required permits and pay all fees associated with the disposal of the material and to secure the disposal site.
- E. Remove existing park signs, street signs and similar structures which must be removed to construct the project. Restore these facilities to the original location or a location designated by the Owner, when work has progressed past the location of the structure. The Contractor shall reinstall or replace those structures which are damaged or lost during the course of construction with new materials or components.
- F. The Contractor shall take full responsibility to protect structures or other surface improvements from damage that are not to be removed. If damage to these facilities occurs due to the construction of the project, the Contractor shall replace or repair them.
- G. The Owner will designate which existing hydrants, valves and boxes, manhole castings and other items removed as part of the construction, are to be salvaged. All other items shall be disposed by the Contractor.
- H. In general, all existing watermain, sanitary sewer and storm sewer pipe being replaced by new improvements shall be considered as debris and removed during the construction process. In certain instances, existing pipes may be abandoned in place, with the approval of the Architect.
- I. Where existing pipes are to be abandoned in place, the exposed pipe ends shall be bulkheaded shut with a watertight non-shrink concrete grout at a thickness of not less than one pipe diameter.

END OF SECTION

SECTION 26 00 01 - GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract (Division 00 70 00), and General Requirements (Division 01 00 00) of the Specifications, apply to the work in Division 26, 27, and 28.
- B. This Section is hereby made a part of all other Sections of Division 26, 27, and 28 as fully as if repeated in each therein.

1.2 DESCRIPTION

- A. Definitions: The terms listed below are defined as follows only when used in Division 26, 27, and 28.
 1. Work: labor and materials of the Contractor and/or Sub-contractor.
 2. Furnish: obtain, coordinate, submit the necessary drawings, deliver to the job site in new condition and guarantee.
 3. Install: receive at the job site, unload, store, set in place, connect, place in operation and guarantee.
 4. Provide: furnish and install.
 5. Connect: bring service to the equipment and make final attachment including necessary switches, outlets, etc.
 6. Conduit: includes, in addition to conduit, all fittings, pull boxes, hangers, and other supports and accessories related to such conduit.
 7. Concealed: hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction, in crawl spaces or buried.
 8. Exposed: not installed underground nor concealed as defined above.
 9. The building structure or building structural members consist of steel columns, steel beams, steel joists (top chord and at panel points), concrete walls and concrete block walls. Metal decking, joist bridging and bottom chords of bar joists shall not be construed as building structure nor as a building structural member for the purpose of support.
 10. Corrosive Environment: Including but not limited to pool (including plenum), pool equipment rooms, and chemical storage rooms.
- B. Provide Electrical work, which is finished work, tested and ready for operation.
 1. Apparatus, appliances, material or work not indicated or any incidental accessories necessary to make the work complete and ready for operation, even though not specified nor shown on the drawings, are to be provided.
 2. Should there be any discrepancies or a question of intent, refer the matter to the Architect/Engineer for decision before ordering equipment or materials and before starting any related work.
 3. Where work connects to that of another trade, or to wiring or equipment in place, take measurements in the field to make connecting work come true and line up with the item being connected.
 4. Where work specified under other Divisions of the Specifications connects to equipment, which is a part of Division 26, provide proper connection(s) to such equipment.

1.3 QUALITY ASSURANCE

- A. Workmanship
 1. All workmanship shall be first class in every respect and shall be performed only by skilled mechanics.
- B. Codes and Standards
 1. Materials and workmanship to comply with applicable codes. As a minimum, codes include; all State and Federal laws, local ordinances, utility company regulations and requirements and recommendations of the following.
 - a. State and Local Building codes
 - b. State Industrial Commission Regulations
 - c. State and Local Fire Codes and Regulations
 - d. National Electric Code
 - e. State and Local Electrical Codes

- f. Occupational Safety and Health Administration Regulations.
2. If these specifications with accompanying drawings are in any way at variance with these codes, the above cited codes shall govern and the Contractor shall make this installation accordingly, except where the drawings or specifications call for a higher quality of work than required by the Code.
 3. These Standards shall be used where referenced by the following abbreviations:
 - AIA: American Insurance Association
 - AIA: American Institute of Architects
 - ANSI: American National Standards Institute
 - APA: APA – The Engineered Wood Association
 - ASTM: American Society of Testing and Materials
 - EPA: Environmental Protection Agency
 - FM: Factory Mutual Insurance Association
 - IEEE: Institute of Electrical and Electronic Engineers
 - IES: Illuminating Engineering Society of North America
 - NBS: National Bureau of Standards
 - NECA: National Electrical Contractors Association
 - NEMA: National Electrical Manufacturers Association
 - NFPA: National Fire Protection Association
 - NSC: National Safety Council
 - UL: Underwriter's Laboratories

1.4 SUBMITTALS

- A. Shop Drawings and Samples: Submit in accordance with the General Conditions and Division 01. Refer to individual sections of Division 26 for supplementary requirements.
- B. All Shop Drawings shall be marked in a way that makes it clear what equipment or materials is being provided. Unmarked Shop Drawings may be returned to Contractor for resubmission.
- C. If Shop Drawings are returned to Contractor as 'Rejected' or 'Revised and Resubmit' three (3) times, the Engineer may choose to charge an Additional Service for further review.
- D. Shop Drawings and other pertinent information shall be submitted and reviewed before equipment is purchased or before fabrication or erection of materials is started.
- E. The Contractor shall check drawings relative to capacity, arrangement and physical dimensions and shall mark the drawings approved prior to submitting for their final review.

1.5 APPROVAL OF MATERIALS

- A. Refer to General conditions and Division 01 for approval requirements.
- B. To obtain approval to use unspecified equipment, bidding contractors shall submit written requests to the Engineer at least ten days prior to bid date. Requests shall clearly describe the equipment for which approval is being requested. Include all data necessary to demonstrate that equipment capacities, features and performance are equivalent to the specific equipment and include a cost comparison between specified equipment and equipment for which approval is being requested. If the equipment is acceptable the Engineer shall approve it in an Addendum.
- C. Where approved substitutes are used, the Contractor assumes responsibility for physical dimensions and other resulting changes. This responsibility extends to include extra work required by other trades as result of the substitution.
- D. Substituted equipment which requires additional costs by other trades in its application shall have such costs borne by the contractor furnishing the equipment.

- E. If substitution of materials occur after Bid is awarded, the Contractor shall provide a submittal for approval to the Engineer. Requests shall clearly describe the equipment for which approval is being requested. Include all data necessary to demonstrate that equipment capacities, features and performance are equivalent to the specific equipment and include a cost comparison between specified equipment and equipment for which approval is being requested. If the equipment is acceptable the Engineer shall approve it in an Addendum or other appropriate manner.

1.6 PERMITS, LICENSES AND FEES

- A. The Contractor shall secure all permits and licenses, both temporary and permanent required for their work. The Contractor shall pay all fees and expenses required for the permits and licenses.
- B. The Contractor shall request inspections as required by regulating agencies and/or regulations. The Contractor shall pay all charges for inspections.
- C. Contractor shall furnish the Owner with a certificate of final inspection and approval by enforcement authorities.

1.7 INSPECTION OF SITE

- A. Prior to submitting a proposal on the work contemplated, bidder shall examine the site of the proposed work and thoroughly familiarize himself with existing conditions and limitations affecting the performance of their work. No extra compensation will be allowed because of misunderstanding as to the amount of work involved nor bidder's failure to verify existing conditions which they could have discovered or reasonably anticipated prior to bidding. Contractor shall be responsible for any additional cutting, patching, before mounting or installation modifications, etc., not called out on the drawings but required for the successful completion of the job. This includes any additional work required due to any existing jobsite condition (i.e., the construction of walls, ceiling spaces, clearances, available voltages, mounting requirements, existing equipment coordination, hazardous materials, etc.) that the contractor had an opportunity to determine in the pre-bid walk-through and could have reasonably determined before the bid by visual inspection or by asking the engineer or owner. No additional money shall be awarded for additional work incurred caused by existing jobsite conditions which could have been verified by the contractor prior to bid. In addition, no additional money shall be awarded for failure to properly coordinate with other trades.

1.8 PLAN INTERPRETATION

- A. The plans are diagrammatic and indicate the arrangement of systems and equipment unless indicated otherwise by dimensions or detail plans of 1/4" = 1'-0" scale or larger. Refer to dimensioned plans for exact locations of building elements. However, field measurements take precedence over dimensioned plans. Report any differences discovered between electrical plans and the plans for other divisions. The installation of all systems and equipment is subject to clarification as indicated in reviewed shop drawings.
- B. Equipment outlines shown on detailed plans of 1/4" = 1'-0" scale or larger and/or dimensions indicated on the plans are limiting dimensions. Do not install any equipment that exceeds the equipment outlines shown or reduces indicated clearances.

1.9 SYSTEMS CONTENT

- A. Provide all materials required for complete and operable systems as specified within. Omissions of specific reference to incidental parts required for complete systems shall not be construed as a release from furnishing such parts.

1.10 CORRELATION OF WORK

- A. Consult the drawings and specifications of Mechanical and other trades for correlating information and lay out work so that it will co-ordinate with other trades. Verify dimensions and conditions (i.e. finished ceiling heights, footing and foundation elevations, beam depths, etc.) with the Architectural and Structural drawings. If conflicts occur such that resolution is not possible by the affected trades on the job, the Architect/Engineer shall be notified so that the proper changes can be made to avoid extra cost to the Owner.

- B. Where work must be replaced due to the failure of the Contractor to verify the conditions existing on the job, such replacement must be accomplished at no cost to the Owner. This shall apply to shop fabricated work as well as to work fabricated in place.
- C. Throughout the course of the work, minor changes and adjustments to the installation may be requested by the Engineer. The Contractor shall make adjustments without additional cost to the Owner, where such adjustments are necessary to the proper installation and operation within the intent of the Contract Documents. This does not include work already completed.
- D. Equipment outlines shown on detail plans of 1/4" = 1'-0" scale or larger and/or dimensions indicated on the plans are limiting dimensions. Do not install any equipment that exceeds the equipment outlines shown or reduces indicated clearances.

1.11 CORRECTIVE PERIOD

- A. The Contractor shall guarantee and maintain the stability of work and materials and keep same in perfect repair and condition for the period of one (1) year after the Date of Substantial Completion of the Project.
- B. Defects of any kind due to faulty work or materials appearing during the above-mentioned period must be immediately made good by the Contractor at their own expense to the entire satisfaction of the Owner and Architect and Engineer. Such reconstruction and repairs shall include damage to the finish or the building resulting from the original defect or repairs thereto.
- C. This guarantee shall not apply to injuries occurring after final acceptance and due to wind, fire, violence, abuse or carelessness or other Contractors or their employees or the agents of the Owner.
- D. This guarantee shall not apply where other guarantees for different lengths of time are specifically called for.

1.12 START-UP SYSTEMS AND OPERATING INSTRUCTIONS

- A. The Owner's designated operating personnel shall be fully instructed by the Contractor in the operation of each type of operating equipment and electrical system at the time it is put into service. A statement from the Owner shall be obtained to the effect that their designated personnel have been instructed.
- B. Each Contractor shall submit to the Engineer two (2) Maintenance and Operating manuals. These manuals shall be submitted in portfolio form neatly edited with similar equipment grouped, tabbed and indexed. Materials shall be printed or typewritten. Each manual shall contain the following:
 - 1. Shop drawings, approved manufacturer's bulletins, and other appropriate data from specific manufacturer and other sources relating to the approved care, maintenance, and operating instructions required of each piece of equipment furnished and/or installed. Shop drawings, manufacturer's bulletin, and other data shall be appropriate marked to reflect the "as-built" condition.
 - 2. List of electrical equipment together with the equipment manufacturer, local representative and local distributor and installing contractor. The list shall be arranged in neat columnar form with current telephone numbers and address provided for listed representatives and distributors.
 - 3. Test reports.

1.13 LIGHTING REBATE SCHEME:

- A. It is the intention to apply the Utility lighting rebate scheme to the project.
- B. The Electrical Contractor shall secure on behalf of the Owner the maximum rebate. This shall include all negotiations, providing substantiation where required, and making all necessary arrangements on behalf of the Owner.

1.14 RECORD DRAWINGS

- A. Provide record drawings in accordance with the requirements of the General Conditions and Division 1.

1.15 CONSTRUCTION LIGHTING & POWER SYSTEM – EXISTING BLDG

- A. Existing building distribution systems shall be used for construction power.

- B. Contractor shall replace all receptacles, switched, coverplates, etc., damaged by any Contractor during the course of construction.
- C. Electrical energy costs shall be paid by the Owner.
- D. Materials furnished by the Electrical Contractor for the system shall remain their property and shall be removed when there is no longer any need for temporary light and power or when so ordered by the Architect.
- E. All receptacles shall have ground fault protection.
- F. Overload protection for circuits and equipment of the temporary light and power system shall comply with the applicable codes relating to permanent work. Panelboards and other protective equipment shall be furnished and installed as required.

PART 2 - PRODUCTS (DOES NOT APPLY)

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

- A. Store and protect products to be installed or turned over to Owner.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect products from dirt, water, construction debris, and traffic.

3.2 CLEAN UP

- A. Contractor shall at all times keep the premises free from accumulation of waste material or rubbish caused by their employees or work. Upon completion of the work they shall remove their rubbish, tools, scaffolding, and surplus materials from and about the building, and shall leave their work areas "broom clean" or its equivalent. Electrical equipment shall be cleaned with temporary identification removed. In case of dispute the Owner will remove the rubbish and charge the cost to the Contractor.
- B. After tests have been made and accepted, the Electrical Contractor shall go over the whole job and clean light fixtures, panels and other equipment installed by him, leaving the entire area in a clean and complete working order.

3.3 PAINTING

- A. Refinish all electrical equipment damaged during shipping and/or installation to its original condition. Remove all rust; prime, and paint per manufacturer's recommendations for finish equal to original.

3.4 MOUNTING HEIGHTS

- A. Coordinate mounting heights, spacing and overall appearance at locations where (2) or more devices are located in the same area.

3.5 SERVICE INTERRUPTIONS

- A. Schedule all interruptions of electric power to the building and/or to areas of the building with the Owner's representative. Interruptions shall be scheduled to minimize the impact on the Owner and their operations.

END OF SECTION

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SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Single conductor building wire.
- B. Metal-clad cable.
- C. Wiring connectors.
- D. Electrical tape.
- E. Heat shrink tubing.
- F. Oxide inhibiting compound.
- G. Wire pulling lubricant.
- H. Cable ties.
- I. Firestop sleeves.

1.2 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 26 00 01 - General Provisions.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 31 23 16 - Excavation.
- F. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.
- G. Section 31 23 23 - Fill: Bedding and backfilling.

1.3 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire.
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes.
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation.
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes.
- G. FS A-A-59544 - Cable and Wire, Electrical (Power, Fixed Installation); Federal Specification.
- H. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.
- J. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems.

- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- M. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- N. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- O. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- P. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- Q. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- R. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
 - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

- A. Submit material list in accordance with Section 26 00 01, describing all material furnished under Part 2 of this Section of the Specifications.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Sustainable Design Documentation: Submit manufacturer's product data on conductor and cable showing compliance with specified lead content requirements.
- D. Field Quality Control Test Reports.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Manufactured Wiring Systems Cable Assemblies: One of each configuration, 6 feet (2000 mm) length.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Metal-clad cable is permitted only as follows:
 - 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - 1) Maximum Length: 6 feet (1.8 m).
 - b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
 - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
 - 2. In addition to other applicable restrictions, may not be used:
 - a. Unless approved by Owner.
 - b. Where not approved for use by the authority having jurisdiction.
 - c. Where exposed to view.
 - d. Where exposed to damage.
 - e. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Provide new conductors and cables manufactured not more than one year prior to installation.
- D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- E. Comply with NEMA WC 70.
- F. Comply with FS A-A-59544 where applicable.
- G. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- H. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- I. Conductors for Grounding and Bonding: Also comply with Section 26 0526.
- J. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.
- K. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
- L. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 3. Tinned Copper Conductors: Comply with ASTM B33.
- M. Minimum Conductor Size:
1. Branch Circuits: #12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet (23 m): #10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet (46 m): #8 AWG, for voltage drop.
 - 3) 20 A, 277 V circuits longer than 150 feet (46 m): #10 AWG, for voltage drop.
 2. Control Circuits: #14 AWG.
- N. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- O. Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
 3. Color Code:
 - a. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.
 - c. Travelers for 3-Way and 4-Way Switching: Pink.
 - d. For control circuits, comply with manufacturer's recommended color code.

2.3 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
1. Copper Building Wire:
 - a. Cerro Wire LLC.
 - b. Encore Wire Corporation.
 - c. General Cable Technologies Corporation.
 - d. Service Wire Co.
 - e. Southwire Company.
 - f. Substitutions: Approved substitute.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
1. Feeders and Branch Circuits:
 - a. #10 AWG and Smaller: Solid.
 - b. #8 AWG and Larger: Stranded.
 2. Control Circuits: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
 - a. #4 AWG and Larger: Type XHHW-2.
 - b. Installed Underground: Type XHHW-2.

- c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

2.4 METAL-CLAD CABLE

- A. Manufacturers:
 - 1. AFC Cable Systems Inc.
 - 2. Encore Wire Corporation.
 - 3. Service Wire Co.
 - 4. Southwire Company.
 - 5. Substitutions: Approved substitute.
- B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- C. Conductor Stranding:
 - 1. #10 AWG and Smaller: Solid.
 - 2. #8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- F. Provide oversized neutral conductors where indicated or required.
- G. Provide dedicated neutral conductor for each phase conductor where indicated or required.
- H. Grounding: Full-size integral equipment grounding conductor.
 - 1. Provide additional isolated/insulated grounding conductor where indicated or required.
- I. Armor: Steel, interlocked tape.
- J. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

2.5 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.
- C. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors #8 AWG and Smaller: Use twist-on insulated spring connectors.
 - 2. Copper Conductors #6 AWG and Larger: Use mechanical connectors or compression connectors.
 - 3. Connectors for Aluminum Conductors: Use compression connectors.
- D. Wiring Connectors for Terminations:
 - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
 - 4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
 - 5. Copper Conductors #8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
 - 6. Aluminum Conductors: Use compression connectors for all connections.
 - 7. Stranded Conductors #10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
 - 8. Conductors for Control Circuits: Use crimped terminals for all connections.

- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
 - 1. Manufacturers:
 - a. 3M.
 - b. Ideal Industries, Inc.
 - c. NSI Industries LLC.
 - d. Substitutions: Approved substitute.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
 - 1. Manufacturers:
 - a. Burndy LLC.
 - b. IlSCO.
 - c. Thomas & Betts Corporation.
 - d. Substitutions: Approved substitute.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
 - 1. Manufacturers:
 - a. Burndy LLC.
 - b. IlSCO.
 - c. Thomas & Betts Corporation.
 - d. Substitutions: Approved substitute.
- J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
 - 1. Manufacturers:
 - a. Burndy LLC.
 - b. IlSCO.
 - c. Thomas & Betts Corporation.
 - d. Substitutions: Approved substitute.

2.6 ACCESSORIES

- A. Electrical Tape:
 - 1. Manufacturers:
 - a. 3M.
 - b. Plymouth Rubber Europa.
 - c. Substitutions: Approved substitute.
 - 2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 - 3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 - 4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
 - 5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
 - 6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil (0.18 mm); suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
 1. Manufacturers:
 - a. 3M.
 - b. Burndy LLC.
 - c. Thomas & Betts Corporation.
 - d. Substitutions: Approved substitute.
- C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
 1. Manufacturers:
 - a. Burndy LLC.
 - b. Ideal Industries, Inc.
 - c. IIsco.
 - d. Substitutions: Approved substitute.
- D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
 1. Manufacturers:
 - a. 3M.
 - b. American Polywater Corporation.
 - c. Ideal Industries, Inc.
 - d. Substitutions: Approved substitute.
- E. Cable Ties: Material and tensile strength rating suitable for application.
 1. Manufacturers:
 - a. Burndy LLC.
 - b. Substitutions: Approved substitute.
- F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.
 1. Products:
 - a. Menzies Metal Products; Electrical Roof Stack and Cap.
 - b. Menzies Metal Products; Electrical Retro Box.
 - c. Substitutions: Approved substitute.
- G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
 1. Products:
 - a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built.
 - b. Substitutions: Approved substitute.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

- A. Circuiting Requirements:
 - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 - 2. When circuit destination is indicated without specific routing, determine exact routing required.
 - 3. Arrange circuiting to minimize splices.
 - 4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
 - 5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 - 6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 - 7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:
 - a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
 - b. Increase size of conductors as required to account for ampacity derating.
 - c. Size raceways, boxes, etc. to accommodate conductors.
 - d. Maximum number of conductors in raceways and boxes shall conform to the latest edition of the NEC with the following exception: Do not fill 1/2" conduit to more than 25% fill.
 - 8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is permitted where not otherwise prohibited, except for the following:
 - a. Branch circuits fed from ground fault circuit interrupter (GFCI) circuit breakers.
 - b. Branch circuits fed from feed-through protection of GFI receptacles.
 - c. Branch circuits with dimming controls.
 - d. Branch circuits with isolated grounding conductor.
 - 9. Provide oversized neutral/grounded conductors where indicated and as specified below.
 - a. Provide 200 percent rated neutral for feeders fed from K-rated transformers.
 - b. Provide 200 percent rated neutral for feeders serving panelboards with 200 percent rated neutral bus.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install metal-clad cable (Type MC) in accordance with NECA 120.
- E. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- F. Exposed Cable Installation (only where specifically permitted):
 - 1. Route cables parallel or perpendicular to building structural members and surfaces.
 - 2. Protect cables from physical damage.
- G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- H. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
 - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
 - 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

- I. Terminate cables using suitable fittings.
 - 1. Metal-Clad Cable (Type MC):
 - a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- J. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- K. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet (1.5 m) of slack.
- L. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- M. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- N. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
 - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- O. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to un-spliced conductors.
 - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
 - 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
 - 3. Wet Locations: Use heat shrink tubing.
- P. Insulate ends of spare conductors using vinyl insulating electrical tape.
- Q. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- R. Identify conductors and cables in accordance with Section 26 05 53.
- S. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- T. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.

- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
 - 1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

3.5 BALANCING LOADS

- A. When connecting single phase circuits and equipment to a three-phase system, distribute the loads among the phases to achieve an approximately balanced loading of the three-phase system.

END OF SECTION

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.

1.2 RELATED REQUIREMENTS

- A. Section 26 00 01 – General Provisions
- B. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
- C. Section 26 05 53 – Identification for Electrical Systems
- D. Section 26 24 16 – Panelboards
- E. Section 26 51 00 – Lighting

1.3 REFERENCE STANDARDS

- A. IEEE 81 – IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System
- B. NECA 1 – Standard for Good Workmanship in Electrical Construction
- C. NEMA GR 1 – Grounding Rod Electrodes and Grounding Rod Electrode Couplings
- D. NETA ATS – Acceptance Testing Specifications for Electrical Power Equipment and Systems
- E. NFPA 70 – National Electrical Code (NEC)
- F. UL 467 - Grounding and Bonding Equipment

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination
 - 1. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
 - 2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

- A. Submit material list in accordance with Section 26 00 01, describing all material furnished under Part 2 of this Section of the Specifications.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Field quality control test reports.
- E. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.6 QUALITY

- A. Comply with requirements of the NEC.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by the NEC and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with the NEC but not less than applicable minimum size requirements specified.
 - 1. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in the NEC. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
 - a. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.
 - b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
 - c. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.
 - 2. Ground Riser: Provide common grounding electrode conductor not less than #3/0 AWG for tap connections to multiple separately derived systems as permitted in the NEC.
- E. Bonding and Equipment Grounding:
 - 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with the NEC.
 - 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 - 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with the NEC.
 - 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 - 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 - 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
 - 7. Provide bonding for interior metal piping systems in accordance with the NEC. This includes, but is not limited to:
 - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
 - b. Metal gas piping.

- c. Metal process piping.
- 8. Provide bonding for interior metal air ducts.
- 9. Provide bonding for metal building frame.
- 10. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.

F. Pole-Mounted Luminaires: Also comply with Section 26 51 00.

2.2 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
 - 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
 - 2. Factory Prefabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gauge of specified conductors.
- C. Connectors for Grounding and Bonding:
 - 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 - 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 - a. Exceptions:
 - 1) Use mechanical connectors for connections to electrodes at ground access wells.
 - 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
 - a. Exceptions:
 - 1) Use exothermic welded connections for connections to metal building frame.
 - 4. Manufacturers - Mechanical and Compression Connectors:
 - a. Advanced Lightning Technology (ALT)
 - b. Burndy LLC
 - c. Harger Lightning & Grounding
 - d. Thomas & Betts Corporation
 - e. Approved substitute.
 - 5. Manufacturers - Exothermic Welded Connections:
 - a. Burndy LLC
 - b. Cadweld, a brand of Erico International Corporation
 - c. thermOweld, subsidiary of Continental Industries
 - d. Approved substitute.
- D. Ground Bars:
 - 1. Description: Copper, rectangular ground bars with mounting brackets and insulators.
 - 2. Size: As indicated.
 - 3. Holes for Connections: As indicated or as required for connections to be made.
 - 4. Manufacturers:
 - a. Advanced Lightning Technology (ALT)
 - b. Erico International Corporation
 - c. Harger Lightning & Grounding
 - d. thermOweld, subsidiary of Continental Industries
 - e. Approved substitute.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Make grounding and bonding connections using specified connectors.
 - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 - 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- D. Identify grounding and bonding system components in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.
- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 05 50 00 - Metal Fabrications.
- C. Section 26 00 01 - General Provisions
- D. Section 26 05 33 - Conduit for Electrical Systems.
- E. Section 26 05 33 - Boxes for Electrical Systems.
- F. Section 26 51 00 - Lighting.

1.3 REFERENCE STANDARDS

- A. ASTM A 123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- B. ASTM A 153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- D. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. MFMA-4 - Metal Framing Standards Publication.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- H. NFPA 70 - National Electrical Code (NEC).
- I. NFPA 101 - Life Safety Code.
- J. UL 5B - Strut-Type Channel Raceways and Fittings.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.5 SUBMITTALS

- A. Submit material list in accordance with Section 26 00 01, describing all material furnished under Part 2 of this Section of the Specifications.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- D. Derating Calculations for Fiberglass Channel (Strut) Framing Systems: Indicate load ratings adjusted for applicable service conditions.
- E. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.
- F. Installer's Qualification Statement: Include evidence of compliance with specified requirements.
- G. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

- A. Comply with the NEC.
- B. Comply with applicable building code.
- C. Installer Qualifications for Field-Welding: As specified in Section 05 50 00.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 5.0. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Do not use products for applications other than as permitted by the NEC and product listing.
 - 5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 - 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.

- C. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
 - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 - 2. Conduit Clamps: Bolted type unless otherwise indicated.
 - 3. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation.
 - b. Erico International Corporation.
 - c. HoldRite, a brand of Reliance Worldwide Corporation.
 - d. O-Z/Gedney, a brand of Emerson Electric Co.
 - e. Thomas & Betts Corporation.
 - f. Substitutions: Approved substitute.
- D. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
 - 1. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation.
 - b. Erico International Corporation.
 - c. HoldRite, a brand of Reliance Worldwide Corporation.
 - d. O-Z/Gedney, a brand of Emerson Electric Co.
 - e. Thomas & Betts Corporation.
 - f. Substitutions: Approved substitute.
- E. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 - 1. Comply with MFMA-4.
 - 2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
 - 3. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
 - 4. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch (2.66 mm).
 - 5. Minimum Channel Dimensions: 1-5/8-inch (41 mm) width by 13/16-inch (21 mm) height.
 - 6. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation.
 - b. Thomas & Betts Corporation.
 - c. Unistrut, a brand of Atkore International Inc.
 - d. Substitutions: Approved substitute.
 - e. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
- F. Fiberglass Channel (Strut) Framing Systems: Factory-fabricated continuous-slot fiberglass channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 - 1. Channel Material: Use polyester resin or vinyl ester resin.
 - 2. Minimum Channel Dimensions: 1-5/8-inch (41 mm) width by 1-inch (25 mm) height.
 - 3. Flammability: Fire retardant with NFPA 101, Class A flame spread index (maximum of 25) when tested in accordance with ASTM E84; self-extinguishing in accordance with ASTM D635.
 - 4. Manufacturers:
 - a. Enduro Composites.
 - b. Substitutions: Approved substitute.
 - c. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
- G. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 - 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2-inch (13 mm) diameter.
 - b. Busway Supports: 1/2-inch (13 mm) diameter.
 - c. Single Conduit up to 1-inch (27 mm) trade size: 1/4-inch (6 mm) diameter.
 - d. Single Conduit larger than 1-inch (27 mm) trade size: 3/8-inch (10 mm) diameter.
 - e. Trapeze Support for Multiple Conduits: 3/8-inch (10 mm) diameter.

- f. Outlet Boxes: 1/4-inch (6 mm) diameter.
 - g. Luminaires: 1/4-inch (6 mm) diameter.
- H. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
- 1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - 2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
 - 3. Mounting Height: Provide minimum clearance of 6 inches (150 mm) under supported component to top of roofing.
 - 4. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation.
 - b. Erico International Corporation.
 - c. PHP Systems/Design.
 - d. Unistrut, a brand of Atkore International Inc.
 - e. Substitutions: Approved substitute.
- I. Anchors and Fasteners:
- 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 - 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 - 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 - 4. Hollow Masonry: Use toggle bolts.
 - 5. Hollow Stud Walls: Use toggle bolts.
 - 6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 - 7. Sheet Metal: Use sheet metal screws.
 - 8. Wood: Use wood screws.
 - 9. Plastic and lead anchors are not permitted.
 - 10. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Minimum Channel Thickness: Steel sheet, 12-gauge, 0.1046 inch (2.66 mm) minimum base metal thickness.
 - d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
 - 11. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.
 - 12. Manufacturers - Mechanical Anchors:
 - a. Hilti, Inc.
 - b. ITW Red Head, a division of Illinois Tool Works, Inc.
 - c. Powers Fasteners, Inc.
 - d. Simpson Strong-Tie Company Inc.
 - e. Substitutions: Approved substitute.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.

- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Field-Welding (where approved by Architect): Comply with Section 05 50 00.
- I. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 30 00.
 - 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- J. Conduit Support and Attachment: Also comply with Section 26 05 33.
- K. Cable Tray Support and Attachment: Also comply with Section 26 05 36.
- L. Box Support and Attachment: Also comply with Section 26 05 33.
- M. Luminaire Support and Attachment: Also comply with Section 26 51 00.
- N. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- O. Secure fasteners according to manufacturer's recommended torque settings.
- P. Remove temporary supports.
- Q. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with the NEC.

3.3 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

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SECTION 26 05 33 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED WORK

- A. Section 26 00 01 – General Provisions
- B. Section 26 05 19 – Conductors and Cable
- C. Section 26 27 26 – Wiring Devices
- D. Section 26 05 29 – Hangers and Supports for Electrical Systems
- E. Section 26 05 53 – Identification for Electrical Systems: Identification products and requirements
- F. Section 26 27 26 – Wiring Devices

1.2 REFERENCES

- A. ANSI C80.1 – Electrical Rigid Steel Conduit (ERSC)
- B. ANSI C80.3 – Electrical Metallic Tubing – Steel (EMT-S)
- C. ANSI C80.5 – Electrical Rigid Metal Conduit – Aluminum (ERMC-A)
- D. ANSI/NEMA FB 1 – Fittings, Cast Metal Boxes, and Conduit bodies for Conduit, Electrical Metallic Tubing, and Cable
- E. NEMA RN-1 - Polyvinyl Chloride (PVC) Externally-Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
- F. NEMA TC 2 – Electrical Polyvinyl Chloride (PVC) Conduit
- G. NEMA TC 3 – Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing
- H. UL – Building Materials Directory
- I. UL 1242 – Intermediate Metallic Conduit – Steel
- J. UL 6A – Electrical Rigid Metal Conduit – Aluminum, Red Brass, and Stainless Steel
- K. UL 514D – Cover Plates for Flush-Mounted Wiring Devices
- L. UL 5 – Surface Metal Raceways and Fittings
- M. NEMA OS 1 – Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports
- N. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum)
- O. NFPA 70 – National Electrical Code (NEC)

1.3 SUBMITTALS

- A. Submit material list in accordance with Section 26 00 01, describing all material furnished under Part 2 of this Section of the Specifications.

1.4 QUALITY

- A. Provide new, first quality material for all products specified. No material shall be reused unless indicated or approved by the Engineer.

PART 2 - PRODUCTS

2.1 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
 - 1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
 - 2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
 - 3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
 - 4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
 - 5. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
 - 6. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
 - 7. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches (100 mm) on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.
- D. Embedded Within Concrete:
 - 1. Within Slab on Grade: Not permitted.
 - 2. Within Slab Above Ground: Not permitted.
 - 3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
 - 4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.
 - 5. Where electrical metallic tubing (EMT) emerges from concrete into salt air, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches (100 mm) on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.
- E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
 - 1. Locations subject to physical damage include, but are not limited to:
 - a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.
 - b. Where exposed below 20 feet (6.1 m) in warehouse areas.

- K. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit.
- L. Concealed, Exterior, Not Embedded in Concrete or in Contact with Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- M. Corrosive Locations Above Ground: Use PVC-coated galvanized steel rigid metal conduit, or aluminum rigid metal conduit.
 - 1. Corrosive locations include, but are not limited to:
 - a. Cooling towers.
- N. Hazardous (Classified) Locations: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), aluminum rigid metal conduit, or PVC-coated galvanized steel rigid metal conduit.
- O. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
 - 1. Maximum Length: 6 feet (1.8 m).
- P. Connections to Vibrating Equipment:
 - 1. Dry Locations: Use flexible metal conduit.
 - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 - 3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
 - 4. Vibrating equipment includes, but is not limited to:
 - a. Transformers.
 - b. Motors.
- Q. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.2 CONDUIT REQUIREMENTS

- A. Electrical Service Conduits: Also comply with Section 26 21 00.
- B. Fittings for Grounding and Bonding: Also comply with Section 26 05 26.
- C. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 1/2-inch (16 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4-inch (21 mm) trade size.
 - 3. Control Circuits: 1/2-inch (16 mm) trade size.
 - 4. Flexible Connections to Luminaires: 1/2-inch (16 mm) trade size.
 - 5. Underground, Interior: 3/4-inch (21 mm) trade size.
 - 6. Underground, Exterior: 1-inch (27 mm) trade size.
- F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 - 1. Allied Tube & Conduit, a division of Atkore International.
 - 2. Nucor Tubular Products.
 - 3. Western Tube, a division of Zekelman Industries.
 - 4. Wheatland Tube, a division of Zekelman Industries.
 - 5. Substitutions: Approved substitute.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
 - 1. Manufacturers:

- a. Bridgeport Fittings Inc
 - b. O-Z/Gedney, a brand of Emerson Electric Co
 - c. Thomas & Betts Corporation
 - d. Approved substitute.
2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 4. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.4 ALUMINUM RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 1. Allied Tube & Conduit, a division of Atkore International.
 2. Nucor Tubular Products.
 3. Western Tube, a division of Zekelman Industries.
 4. Wheatland Tube, a division of Zekelman Industries.
 5. Substitutions: Approved substitute.
- B. Description: NFPA 70, Type RMC aluminum rigid metal conduit complying with ANSI C80.5 and listed and labeled as complying with UL 6A.
- C. Fittings:
 1. Manufacturers:
 - a. Bridgeport Fittings Inc
 - b. O-Z/Gedney, a brand of Emerson Electric Co
 - c. Thomas & Betts Corporation
 - d. Approved substitute.
 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 4. Material: Use aluminum.
 5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.5 INTERMEDIATE METAL CONDUIT (IMC)

- A. Manufacturers:
 1. Allied Tube & Conduit, a division of Atkore International.
 2. Nucor Tubular Products.
 3. Western Tube, a division of Zekelman Industries.
 4. Wheatland Tube, a division of Zekelman Industries.
 5. Substitutions: Approved substitute.
- B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- C. Fittings:
 1. Manufacturers:
 - a. Bridgeport Fittings Inc
 - b. O-Z/Gedney, a brand of Emerson Electric Co
 - c. Thomas & Betts Corporation
 - d. Approved substitute.

2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
4. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.6 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 1. Thomas & Betts Corporation
 2. Robroy Industries
 3. Approved substitute.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- C. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil (1.02 mm).
- D. Interior Coating: Urethane, minimum thickness of 2 mil (0.05 mm).
- E. PVC-Coated Fittings:
 1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
 2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
 3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 4. Material: Use steel or malleable iron.
 5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil (1.02 mm).
 6. Interior Coating: Urethane, minimum thickness of 2 mil (0.05 mm).
- F. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil (0.38 mm).

2.7 FLEXIBLE METAL CONDUIT (FMC)

- A. Manufacturers:
 1. AFC Cable Systems, Inc.
 2. Electri-Flex Company
 3. International Metal Hose
 4. Approved substitute.
- B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- C. Fittings:
 1. Manufacturers:
 - a. Bridgeport Fittings Inc.
 - b. O-Z/Gedney, a brand of Emerson Electric Co.
 - c. Thomas & Betts Corporation
 - d. Approved substitute.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.

2.8 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Manufacturers:
 1. AFC Cable Systems, Inc.

2. Electri-Flex Company
 3. International Metal Hose
 4. Approved substitute.
- B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- C. Fittings:
1. Manufacturers:
 - a. Bridgeport Fittings Inc.
 - b. O-Z/Gedney, a brand of Emerson Electric Co.
 - c. Thomas & Betts Corporation
 - d. Approved substitute.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.

2.9 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
1. Allied Tube & Conduit, a division of Atkore International.
 2. Nucor Tubular Products.
 3. Western Tube, a division of Zekelman Industries.
 4. Wheatland Tube, a division of Zekelman Industries.
 5. Substitutions: Approved substitute.
- B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Fittings:
1. Manufacturers:
 - a. Bridgeport Fittings Inc.
 - b. O-Z/Gedney, a brand of Emerson Electric Co.
 - c. Thomas & Betts Corporation
 - d. Approved substitute.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 4. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.
 - b. Do not use set-screw type connectors and couplings.
 5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.
 6. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.10 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Manufacturers:
1. Cantex Inc.
 2. Carlon, a brand of Thomas & Betts Corporation
 3. JM Eagle
 4. Approved substitute.
- B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- C. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.

2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.11 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil (0.51 mm).
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).
- E. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
- F. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig. Suitable for the conduits to be installed.
- G. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
 1. Products:
 - a. Menzies Metal Products; Electrical Roof Stack and Cap
 - b. Menzies Metal Products; Electrical Retro Box
 - c. Approved substitute.
- H. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
 1. Manufacturers:
 - a. Quickflash Weatherproofing Products, Inc.
 - b. Approved substitute.
- I. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
 1. Products:
 - a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built
 - b. Approved substitute.
- J. Bore Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for installation within casing; furnished with roller wheels to facilitate installation, openings to facilitate grout flow, and holes for stabilization cable; suitable for the casing and conduit/duct arrangement to be installed.
 1. Products:
 - a. Advance Products & Systems, LLC; Bore Spacers
 - b. Approved substitute.

2.12 RACEWAY REQUIREMENTS

- A. Provide all components, fittings, supports, and accessories required for a complete raceway system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

2.13 SURFACE RACEWAY SYSTEMS

- A. Manufacturers:
 1. Hubbell Incorporated
 2. Wiremold, a brand of Legrand North America, Inc.
 3. MonoSystems, Inc.
 4. Approved substitute.
- B. Surface Metal Raceway (Small):

1. Listed and labeled as complying with UL 5.
 2. Provide surface metal raceway for power, lighting, and systems services as indicated on the Drawings.
 3. Installation shall be complete with all necessary fittings to form a complete system. Installation shall conform to Article 352 of the NEC.
 4. Raceway shall consist of a Factory Assembly designed to accommodate pulling wires into the raceway.
- C. Surface Metal Raceway (Large):
1. Listed and labeled as complying with UL 5.
 2. Base section shall be a minimum of 18 gauge; cover section shall be a minimum of 20 gauge.
 3. Raceway shall be 4-3/4 inches high. Raceway shall be divided into two compartments where indicated on the Drawings.
 4. Single Compartment Raceway shall be 2-3/4 inches high.
 5. Raceway shall consist of a Factory Assembly designed to accommodate pulling wires into the raceway.
- D. Metal Channel (Strut) Used as Raceway: Comply with Section 26 05 29.

2.14 WIREWAYS

- A. Manufacturers:
1. Cooper B-Line, a division of Cooper Industries
 2. Hoffman, a brand of Pentair Technical Products
 3. Schneider Electric; Square D Products
 4. Enduro Composites
 5. Approved substitute.
- B. Description: Lay-in wireways and wiring troughs with removable covers; listed and labeled as complying with UL 870.
- C. Wireway Type, Unless Otherwise Indicated:
1. Indoor Clean, Dry Locations: NEMA 250, Type 1, painted steel with screw-cover.
 2. Outdoor Locations: NEMA 250, Type 3R, painted steel with screw-cover; include provision for padlocking.
- D. Finish for Painted Steel Wireways: Manufacturer's standard grey unless otherwise indicated.
- E. Wireways shall be provided without knockouts.
- F. Minimum Wireway Size: 4 by 4 inches (100 by 100 mm) unless otherwise indicated.
- G. Where wireway size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.15 FIRESTOPPING

- A. Seal all openings around conduit or other electrical work penetrating fire and smoke rated partitions, floors, and ceilings.
- B. Firestop material shall comply with UL 1479, NEC 300-21, and NEC 800-3(c).
- C. Acceptable Manufacturers:
1. 3M
 2. Nelson
 3. Approved substitute

2.16 BOXES

- A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 3. Provide products listed, classified, and labeled as suitable for the purpose intended.

4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
 4. Use cast aluminum boxes where aluminum rigid metal conduit is used.
 5. Use nonmetallic boxes where exposed rigid PVC conduit is used.
 6. Use suitable concrete type boxes where flush-mounted in concrete.
 7. Use suitable masonry type boxes where flush-mounted in masonry walls.
 8. Use raised covers suitable for the type of wall construction and device configuration where required.
 9. Use shallow boxes where required by the type of wall construction.
 10. Do not use "through-wall" boxes designed for access from both sides of wall.
 11. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 12. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 13. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
 14. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 15. Boxes for Ganged Devices: Use multi-gang boxes of single-piece construction. Do not use field-connected gang-able boxes unless specifically indicated or permitted.
 16. Minimum Box Size, Unless Otherwise Indicated:
 - a. Wiring Devices (Other Than Communications Systems Outlets): 4-inch square by 1-1/2-inch-deep (100 by 38 mm) trade size.
 - b. Ceiling Outlets: 4 inch octagonal or square by 1-1/2-inch-deep (100 by 38 mm) trade size.
 17. Wall Plates: Comply with Section 26 27 26.
 18. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation
 - b. Hubbell Incorporated; Bell Products
 - c. Hubbell Incorporated; RACO Products
 - d. O-Z/Gedney, a brand of Emerson Electric Co
 - e. Thomas & Betts Corporation.
 - f. Approved substitute
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 - a. Indoor Clean, Dry Locations: Type 1, painted steel.
 - b. Outdoor Locations: Type 3R, painted steel.
 3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
 - b. Boxes 6 square feet (0.56 sq m) and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
 4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
 - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
 - b. Back Panels: Painted steel, removable.
 - c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
 5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
 6. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation

- b. Hoffman, a brand of Pentair Technical Products
 - c. Hubbell Incorporated; Wiegmann Products
 - d. Approved substitute
- D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gang-able boxes may be used.
- 1. Manufacturers:
 - a. Hubbell Incorporated
 - b. Approved substitute
- E. Boxes for Hazardous (Classified) Locations: Listed and labeled as complying with UL 1203 and NFPA 70 for the classification of the installed location.
- 1. Manufacturers:
 - a. Appleton, a brand of Emerson Electric Co
 - b. Cooper Crouse-Hinds, a division of Eaton Corporation
 - c. Hubbell Incorporated; Killark Products
 - d. Approved substitute
- F. Underground Boxes/Enclosures:
- 1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless-steel tamper resistant cover bolts.
 - 2. Size: As indicated on drawings.
 - 3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
 - 4. Provide logo on cover to indicate type of service.
 - 5. Applications:
 - a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 8 load rating.
 - b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 15 load rating.
 - c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
 - 6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
 - a. Manufacturers:
 - 1) Hubbell Incorporated; Quazite Products
 - 2) MacLean Highline
 - 3) Oldcastle Precast, Inc
 - 4) Approved substitute
 - b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.
 - c. Product(s):
 - 1) MacLean Highline PHA Series: Straight wall, all-polymer concrete splice box/pull box; available Tier 8, Tier 15, and Tier 22 load ratings.
 - (a) 11 by 18 by 12 inches nominal; Model PHA111812 (stackable).
 - 2) MacLean Highline CHA Series: Fiberglass/polymer concrete splice box/pull box; available Tier 8 and Tier 15 load ratings.
 - (a) 11 by 18 by 12 inches nominal; Model CHA111812.
 - 3) MacLean Highline CVA Series: Fiberglass/polymer concrete splice vault; available Tier 8, Tier 15, and Tier 22 load ratings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive equipment.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 CONDUIT INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.
- E. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- F. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- G. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- H. Conduit Routing:
 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 2. When conduit destination is indicated without specific routing, determine exact routing required.
 3. Conceal all conduits unless specifically indicated to be exposed.
 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 5. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - d. Across building exterior surfaces.
 6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
 7. Arrange conduit to maintain adequate headroom, clearances, and access.
 8. Arrange conduit to provide no more than the equivalent of four 90-degree bends between pull points.
 9. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
 10. Route conduits above water and drain piping where possible.
 11. Route all exposed conduit in a neat, workmanlike manner parallel to the building lines, tight to the wall and ceiling surfaces, and firmly support with conduit clamps or hangers.
 12. Do not route conduits in columns except to feed column mounted devices.
 13. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 14. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
 15. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.
 - c. Flues.
 16. Group parallel conduits in the same area together on a common rack.
- I. Conduit Support:
 1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems. See Paragraph 26 00 01.1.2 for definition of "building structure".
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 4. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.

5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
 8. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
 9. Use of spring steel conduit clips for support of conduits is not permitted.
 - a. Support of electrical metallic tubing (EMT) up to 1-inch (27 mm) trade size concealed above accessible ceilings and within hollow stud walls.
 10. Use of wire for support of conduits is not permitted.
 - a. For securing conduits to studs in hollow stud walls.
 - b. For suspending conduits supported by spring steel conduit clips (only where specifically indicated or permitted).
 11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.
- J. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 3. Use suitable adapters where required to transition from one type of conduit to another.
 4. Provide drip loops for liquid tight flexible conduit connections to prevent drainage of liquid into connectors.
 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
 7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- K. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Conceal bends for conduit risers emerging above ground.
 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
 7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 9. Provide metal escutcheon plates for conduit penetrations exposed to public view.
 10. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in this Section and in Section 07 84 00.
- L. Underground Installation:
1. Provide trenching and backfilling in accordance with Section 31 23 16.13.
 2. Provide trenching and backfilling in accordance with Section 31 23 16 and Section 31 23 23.
 3. Minimum Cover, Unless Otherwise Indicated or Required:
 - a. Underground, Exterior: 24 inches (610 mm).
 - b. Under Slab on Grade: 12 inches (300 mm) to bottom of slab.

4. Provide underground warning tape in accordance with Section 26 05 53 along entire conduit length for service entrance where not concrete-encased.
- M. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 30 00 with minimum concrete cover of 3 inches (76 mm) on all sides unless otherwise indicated.
- N. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with NFPA 70.
- O. Swimming facilities
 1. Pump/equipment rooms – Conduit shall be the following types:
 - a. Galvanized rigid steel conduit
 - b. Plastic coated rigid steel conduit
 - c. Rigid non-metallic conduit (if acceptable to the authority having jurisdiction)
 - d. Liquid tight flexible metal conduit (for connections to vibrating equipment)
 2. Chemical rooms – Conduit shall be the following types

PROVIDE IF SPECIAL PURPOSE OUTLETS ARE REQUIRED.

- a. Galvanized rigid steel conduit:
 - b. Plastic coated rigid steel conduit
 - c. Rigid non-metallic conduit (if acceptable to the authority having jurisdiction)
 - d. Liquid tight flexible metal conduit (for connections to vibrating equipment)
- P. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
 4. Where conduits are subject to earth movement by settlement or frost.
- Q. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
 3. Where conduits penetrate coolers or freezers.
- R. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.
- S. Provide grounding and bonding in accordance with Section 26 05 26.

3.3 DISTRIBUTION FEEDERS

- A. Provide all conduit and wire necessary to complete the distribution feeder circuits as shown on the drawings. Size all raceways as required by the National Electrical Code with oversized conduits as indicated.
- B. Provide pull and junction boxes as required by the National Electrical Code and located to be accessible after completion of the project.
- C. Overhead feeder conduits shall be rigid metal conduit or intermediate metal conduit. Overhead conduits may be electrical metallic tubing above finished ceiling areas.
- D. Underground feeder conduits shall be rigid steel or rigid PVC. Provide insulated grounding conductor sized per NEC when PVC conduit is used.

3.4 BRANCH CIRCUITS

- A. Branch circuit wire shall be encased in a continuous raceway. Size all raceway as required by the National Electrical Code with oversize conduits as indicated. Minimum branch circuit homerun conduit size: 3/4". Minimum conduit size 1/2", unless indicated otherwise. The raceway shall be EMT with the following exceptions:
 1. Rigid steel conduit shall be used in the following instances:
 - a. Where exposed to physical damage
 - b. Stub-ups one (1) inch or less in diameter
 - c. Exposed drops one (1) inch or less in diameter
 2. Rigid steel, IMC or rigid PVC shall be used in the following instances:
 - a. Exterior
 - b. Underground
 - c. Embedded in concrete
 3. Flexible metal conduit or cable shall be used in the following instances:
 - a. Connection to utilization equipment in dry locations
 - b. Motor and transformer connections
 - c. In inaccessible locations

3.5 SURFACE RACEWAY INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install raceways plumb and level.
- D. Arrange wireways and associated raceway connections to comply with NFPA 70, including but not limited to requirements for deflected conductors and wireways used as pull boxes. Increase size of wireway where necessary.
- E. Secure and support raceways in accordance with Section 26 05 29 at intervals complying with NFPA 70 and manufacturer's requirements.
 1. Anchor raceway every 18 inches and not over six (6) inches from lead end.
- F. Close unused raceway openings.
- G. Provide grounding and bonding in accordance with Section 26 05 26.
 1. Provide a separate ground conductor in each section of raceway and bund to conduit system in and approved manner.
- H. No surface mounted raceway shall be allowed in food service areas. Boxes and conduit shall be recessed.
- I. Identify raceways in accordance with Section 26 05 53.

3.6 EXCAVATION AND BACKFILLING

- A. All excavation and backfilling required to complete the installation of the electrical system shall be the responsibility of this Contractor. The work shall be done in a manner to conform with the provisions of Section 31 23 00 Earthwork of these specifications.
- B. Bed all conduit and structures on a 6-inch thick compacted layer of granular material. Should unsatisfactory soil conditions be discovered, the Engineer/Architect will inspect the excavation and determine the necessary additional support required.
- C. Backfill around conduit and structures by hand using coarse sand, pit run gravel or the native material if it is similar to the above. Remove all large stones, frozen lumps, perishable rubbish, and tramp metal. Carefully compact this material in 6-inch layers to a depth of 8 inches above the conduit, cable, or duct.

- D. Replace all existing surface improvements (i.e. street pavement, curbs, sidewalks, finish sodding, etc.) removed or damaged in the course of the work unless such improvements are to be reconstructed under the general contract. Make all necessary arrangements to perform such repairs, pay all costs in connection therewith and include them in the bid.

3.7 CUTTING AND PATCHING

- A. Do all cutting and patching of building materials as required for the installation of the work. No structural members shall be cut without the written approval of the Engineer/Architect and any such cutting shall be done in a manner satisfactory to the Engineer/Architect.
- B. All patching of or repair of damage to work in place shall be done in a neat and workmanlike manner with the approval of the Engineer/Architect. The Contractor whose operations require cutting of work in place, or who cause damage which entails repairs of such work, shall employ mechanics of the particular trade whose work must be cut or which is damaged, and shall pay all costs of such patching or repair.
- C. All holes through pre-cast concrete shall be drilled.
- D. Contractor shall be responsible for any additional cutting, patching, mounting/installation modifications, etc., not called out on the drawings but required for the successful completion of the job. This would include additional work required due to any existing jobsite condition (i.e., the construction of walls, ceiling spaces, clearances, available voltages, mounting requirements, existing equipment coordination, hazardous materials, etc.) that the contractor had an opportunity to determine in the pre-bid walk-through and could have reasonably determined before the bid by visual inspection or by asking the engineer or owner. No additional money shall be awarded for additional work incurred caused by existing jobsite conditions which could have been verified by the contractor prior to bid. In addition, no additional money shall be awarded for failure to properly coordinate with other trades.

3.8 SLEEVES

- A. Set all sleeves true to line, grade and position and plumb or level after concrete is poured. Correct any deviation from proper position.
- B. Schedule 40 pipe sleeves shall have at least three (3) concrete anchors.
- C. Provide galvanized steel tube sleeve 1 1/2 inches larger than the outside diameter of conduit. Sleeve shall have wall thickness of 0.061 inches.
- D. Where conduit pass through exterior concrete walls below grade, caulk both sides with oakum and lead wool or otherwise adequately waterproof the openings around the conduit.
- E. Caulk spaces between pipe and floor sleeves inside the building with a waterproof caulking material. Spaces between pipe and exterior partition sleeves shall be caulked with glass fiber insulation.
- F. Where conduits pass through the roof furnish sealable penetration pockets compatible with the building roofing system. Pockets to be turned over to the General Contractor.
- G. Seal all sleeves or raceway penetrations of smoke or fire rated walls or floors with intumescent type fire barriers, 3M or approved equal.

3.9 BOX INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Box Locations:
1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
 2. Unless dimensioned, box locations indicated are approximate.
 3. Locate boxes as required for devices installed under other sections or by others.
 - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.
 - b. Communications Systems Outlets: Comply with Section 27 05 28.
 4. Locate boxes so that wall plates do not span different building finishes.
 5. Locate boxes so that wall plates do not cross masonry joints.
 6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
 8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) horizontal separation.
 9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
 - b. Do not install flush-mounted boxes with area larger than 16 square inches (0.0103 sq m) or such that the total aggregate area of openings exceeds 100 square inches (0.0645 sq m) for any 100 square feet (9.29 sq m) of wall area.
 10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points.
 11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
 - a. Concealed above accessible suspended ceilings.
 - b. Within joists in areas with no ceiling.
 - c. Electrical rooms.
 - d. Mechanical equipment rooms.
- I. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
 4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- J. Install boxes plumb and level.
- K. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- L. Floor-Mounted Cabinets: Mount on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 30 00.
- M. Install boxes as required to preserve insulation integrity.

- N. Underground Boxes/Enclosures:
 - 1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.
 - 2. Flush-mount enclosures located in concrete or paved areas.
 - 3. Mount enclosures located in landscaped areas with top at 1 inch (25 mm) above finished grade.
 - 4. Provide cast-in-place concrete collar constructed in accordance with Section 03 30 00, minimum 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep), around enclosures that are not located in concrete areas.
 - 5. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
- O. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- Q. Close unused box openings.
- R. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- S. Provide grounding and bonding in accordance with Section 26 05 26.
- T. Identify boxes in accordance with Section 26 05 53.
- U. Position outlet boxes to locate luminaires as shown on reflected ceiling plan (RCP).

3.10 MOUNTING HEIGHTS

- A. Coordinate mounting heights, spacing and overall appearance at locations where two (2) or more devices are in the same area.

3.11 IDENTIFICATION

- A. Use marking pen to label all feeder junction and pull boxes; communications systems junction and pull boxes; all junction boxes, pull boxes, and raceways installed for future use.
- B. Provide engraved cover plates where indicated on the Drawings.

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SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Underground warning tape.
- F. Floor marking tape.
- G. Warning signs and labels.

1.2 RELATED SECTIONS

- A. Section 09 91 13 - Exterior Painting.
- B. Section 09 91 23 - Interior Painting.
- C. Section 26 01 00 - General Provisions.
- D. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
- E. Section 26 27 26 - Wiring Devices.

1.3 REFERENCES

- A. ANSI Z535.2 – American National Standard for Environmental and Facility Safety Signs
- B. ANSI Z535.4 – American National Standard for Product Safety Signs and Labels
- C. NFPA 70 – National Electrical Code (NEC)
- D. NFPA 70E – Standard for Electrical Safety in the Workplace
- E. UL 969 - Marking and Labeling Systems

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are complete.

1.5 SUBMITTALS

- A. Submit material list in accordance with Section 26 00 01, describing all material furnished under Part 2 of this Section of the Specifications.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.
- D. Samples:

1. Identification Nameplates: One of each type and color specified.
 2. Warning Signs and Labels: One of each type and legend specified.
- E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.6 QUALITY

- A. Comply with requirements of the NEC.

1.7 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 - PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

- A. Existing Work: Unless specifically excluded, identify existing elements to remain whose designations are changed as part of the new work.
- B. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- C. Identification for Equipment:
1. Use identification nameplate or identification label to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify main overcurrent protective device. Use identification nameplate for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
 - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - b. Enclosed switches, circuit breakers, and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
 - 3) Identify load(s) served. Include location when not within sight of equipment.
 - c. Time Switches:
 - 1) Identify load(s) served and associated circuits controlled. Include location.
 - d. Enclosed Contactors:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).
 - 4) Identify coil voltage.
 - 5) Identify load(s) and associated circuits controlled. Include location.
 2. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
 3. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
 4. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
 5. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.

6. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
 7. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
 8. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
- D. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
 3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes when more than one circuit is present.
 - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
 4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
- E. Identification for Raceways:
1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet (6.1 m).
 2. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet (6.1 m).
 - a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches (76 mm) wide.
 - 1) Field-Painting: Comply with Section 09 9123 and 09 91 13.
 - 2) Vinyl Color Coding Electrical Tape: Comply with Section 26 05 19.
 3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
 4. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
 5. Use underground warning tape to identify underground raceways.
 6. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet (6.1 m).
- F. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.
 2. Use voltage markers or color-coded boxes to identify systems other than normal power system.
 - a. Color-Coded Boxes: Field-painted in accordance with Section 09 91 23 and 09 91 13 per the same color code used for raceways.
 - b. For exposed boxes in public areas, do not color code.
 3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
 - a. For exposed boxes in public areas, use only identification labels.
- G. Identification for Devices:
1. Wiring Device and Coverplate Finishes: Comply with Section 26 27 26.
 2. Factory Pre-Marked Coverplate: Comply with Section 26 27 26.
 3. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
 - a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
 4. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.

5. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.
- H. Identification for Luminaires:
 1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 1. Manufacturers:
 - a. Brimar Industries, Inc
 - b. Kolbi Pipe Marker Co
 - c. Seton Identification Products
 - d. Substitutions: Approved substitute.
 2. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
 3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
 - a. Exception: Provide minimum thickness of 1/8 inch (3 mm) when any dimension is greater than 4 inches (100 mm).
 4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- B. Identification Labels:
 1. Manufacturers:
 - a. Brady Corporation
 - b. Brother International Corporation
 - c. Panduit Corp
 - d. Substitutions: Approved substitute.
 2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - a. Use only for indoor locations.
 3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
 1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
 2. Legend:
 - a. System designation where applicable:
 - 1) Emergency Power System: Identify with text "EMERGENCY".
 - 2) Fire Alarm System: Identify with text "FIRE ALARM".
 - b. Equipment designation or other approved description.
 - c. Other information as indicated.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height:
 - a. System Designation: 1 inch (25 mm).
 - b. Equipment Designation: 1/2 inch (13 mm).
 - c. Other Information: 1/4 inch (6 mm).
 - d. Exception: Provide minimum text height of 1 inch (25 mm) for equipment located more than 10 feet (3.0 m) above floor or working platform.
 5. Color:
 - a. Normal Power System: White text on black background.
- D. Format for General Information and Operating Instructions:
 1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.

3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 1/4 inch (6 mm).
 5. Color: Black text on white background unless otherwise indicated.
- E. Format for Caution and Warning Messages:
1. Minimum Size: 2 inches (51 mm) by 4 inches (100 mm).
 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 1/2 inch (13 mm).
 5. Color: Black text on yellow background unless otherwise indicated.
- F. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 2. Legend: Power source and circuit number or other designation indicated.
 - a. Include voltage and phase for other than 120 V, single phase circuits.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 3/16 inch (5 mm).
 5. Color: Black text on clear background.
- G. Format for Control Device Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 2. Legend: Load controlled or other designation indicated.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 3/16 inch (5 mm).
 5. Color: Black text on clear background.

2.3 WIRE AND CABLE MARKERS

- A. Manufacturers:
1. Brady Corporation
 2. HellermannTyton
 3. Panduit Corp
 4. Substitutions: Approved substitute.
- B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- D. Legend: Power source and circuit number or other designation indicated.
- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
1. Do not use handwritten text.
- F. Minimum Text Height: 1/8 inch (3 mm).
- G. Color: Black text on white background unless otherwise indicated.

2.4 VOLTAGE MARKERS

- A. Manufacturers:
1. Brady Corporation
 2. Brimar Industries, Inc
 3. Seton Identification Products
 4. Substitutions: Approved substitute.
- B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

- C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- D. Minimum Size:
 - 1. Markers for Equipment: 1-1/8 by 4-1/2 inches (29 by 110 mm).
 - 2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
 - 3. Markers for Pull Boxes: 1-1/8 by 4-1/2 inches (29 by 110 mm).
 - 4. Markers for Junction Boxes: 1/2 by 2-1/4 inches (13 by 57 mm).
- E. Legend:
 - 1. Markers for Voltage Identification: Highest voltage present.
 - 2. Markers for System Identification:
 - a. Emergency Power System: Text "EMERGENCY".
 - b. Other Systems: Type of service.
- F. Color: Black text on orange background unless otherwise indicated.

2.5 UNDERGROUND WARNING TAPE

- A. Manufacturers:
 - 1. Brady Corporation
 - 2. Brimar Industries
 - 3. Seton Identification Products
 - 4. Substitutions: Approved substitute
- B. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
 - 1. Exception: Use foil-backed detectable type tape where required by serving utility or where directed by Owner.
- C. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).
- D. Foil-backed Detectable Type Tape: 3 inches (76 mm) wide, with minimum thickness of 5 mil (0.1 mm), unless otherwise required for proper detection.
- E. Legend: Type of service, continuously repeated over full length of tape.
- F. Color:
 - 1. Tape for Buried Power Lines: Black text on red background.
 - 2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.6 FLOOR MARKING TAPE

- A. Manufacturers:
 - 1. Brady Corporation
 - 2. Brimar Industries, Inc
 - 3. Seton Identification Products
 - 4. Substitutions: Approved substitute.
- B. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminated, 3 inches (76 mm) wide, with alternating black and white stripes.

2.7 WARNING SIGNS AND LABELS

- A. Manufacturers:
 - 1. Brimar Industries, Inc
 - 2. Clarion Safety Systems, LLC
 - 3. Seton Identification Products
 - 4. Substitutions: Approved substitute.
- B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- C. Warning Signs:

1. Materials:
 - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
 - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
 3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- D. Warning Labels:
1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - a. Do not use labels designed to be completed using handwritten text.
 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 1. Surface-Mounted Equipment: Enclosure front.
 2. Flush-Mounted Equipment: Inside of equipment door.
 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 4. Elevated Equipment: Legible from the floor or working platform.
 5. Branch Devices: Adjacent to device.
 6. Interior Components: Legible from the point of access.
 7. Conduits: Legible from the floor.
 8. Boxes: Outside face of cover.
 9. Conductors and Cables: Legible from the point of access.
 10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
 1. Do not use adhesives on exterior surfaces except where substrate cannot be penetrated.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.
- G. Secure rigid signs using stainless steel screws.
- H. Mark all handwritten text, where permitted, to be neat and legible.

3.3 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 26 05 83 - WIRING CONNECTIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electrical connections to equipment.

1.2 RELATED REQUIREMENTS

- A. Section 26 00 01 – General Provisions
- B. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
- C. Section 26 05 33 – Raceways and Boxes
- D. Section 26 27 26 – Wiring Devices
- E. Section 26 28 16 – Disconnect Switches
- F. Section 26 29 13 – Enclosed Controllers

1.3 REFERENCE STANDARDS

- A. NEMA WD 1 – General Color Requirements for Wiring Devices
- B. NEMA WD 6 – Wiring Devices - Dimensional Specifications
- C. NFPA 70 – National Electrical Code (NEC)

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
 - 2. Determine connection locations and requirements.
- B. Sequencing:
 - 1. Install rough-in of electrical connections before installation of equipment is required.
 - 2. Make electrical connections before required start-up of equipment.

1.5 SUBMITTALS

- A. Submit material list in accordance with Section 26 00 01, describing all material furnished under Part 2 of this Section of the Specifications.
- B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of the NEC.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
 - 1. Colors: Comply with NEMA WD 1.
 - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
 - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Disconnect Switches: As specified in Section 26 28 16 and in individual equipment sections.
- C. Wiring Devices: As specified in Section 26 27 26.
- D. Raceways and Boxes: As specified in Section 26 05 33.
- E. Wire and Cable: As specified in Section 26 05 19.
- F. Wire Connectors
 - 1. Acceptable Manufacturers:
 - a. AMP Distributor Industries.
 - b. Ideal Industries.
 - c. 3M Company.
 - 2. Conical spring type with plastic or nylon insulating outer shell, color coded to denote wire size, for conductor sizes #14 through #10 AWG.
 - 3. Butt compression style insulating crimp splices for conductors smaller than #14 AWG.
- G. Connectors, Splices & Taps
 - 1. Acceptable Manufacturers:
 - a. AMP Distributor Industries.
 - b. OZ Gedney.
 - c. ILSCO.
 - d. Burndy.
 - 2. Compression or setscrew type, insulating cover for use on conductors #8 AWG and smaller.
 - 3. Compression type or split bolt connectors with insulating covers for conductors #6 AWG and larger.
- H. Lugs
 - 1. Acceptable Manufacturers:
 - a. ILSCO.
 - b. Teledyne Penn-Union.
 - c. Burndy Corporation.
 - 2. Compression Type: Seamless, one-piece, copper; size for conductor applied to.
 - 3. Connections to Set Screw Lugs: Pin type compression fittings for use on conductors #2 AWG and larger with barrels filled with conductive paste.
- I. Crimp-On Terminals
 - 1. Acceptable Manufacturers:
 - a. AMP Distributor Industries.
 - b. 3M Company.
 - c. Thomas-Betts.
 - 2. Crimp on insulated for conductors ranging from #14 through #10 AWG, flanged fork or ring tongue style.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 INSTALLATION

- A. Bus Connection: Use compression lugs, bolt to bus bars using cap screws, lock washers and nuts of material electrically compatible with bus, for connections to switchboard and main distribution panelboards only.
- B. Set Screw Lug Connection: Install pin type compression fitting of similar construction as compression lugs.
- C. Use crimping tool supplied by manufacturer of connector to install on conductor. Do not remove conductor strands or over-size terminators. Apply insulating tape over exposed conductor surfaces to 150% of the conductor insulating material.
- D. Strip conductor insulation as prescribed by the manufacturer of the terminator. Use conductive paste where required for dissimilar materials or as recommended by the manufacturer.
- E. Tighten connections to ensure maximum surface contact between terminals.

3.3 MOTOR CONNECTIONS

- A. Use crimp-on connectors for motor terminations from stranded conductors and where terminal lugs are not provided at connection point. Use ring-tongue terminals wherever possible

3.4 EQUIPMENT CONNECTIONS

- A. Make final connection to all equipment indicated on the Drawings except those items explicitly noted.
- B. Coordinate with equipment installers prior to completing rough-in and to making connection.
- C. Where equipment is indicated as "Future", provide conduit and conductors to the outlet indicated on the Drawings. Provide receptacle where indicated.

END OF SECTION

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SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Occupancy sensors.
- B. Time switches.
- C. Outdoor photo controls.
- D. Daylighting controls.
- E. Lighting contactors.
- F. LED Controllers
- G. Accessories.

1.2 RELATED REQUIREMENTS

- A. Section 26 01 00 - General Provisions
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 33 - Raceways and Boxes.
- E. Section 26 05 53 - Identification for Electrical Systems.
- F. Section 26 05 73 - Power System Studies.
- G. Section 26 27 26 - Wiring Devices.
- H. Section 26 28 13 - Fuses.
- I. Section 26 29 13 - Enclosed Controllers.
- J. Section 26 51 00 - Lighting.

1.3 REFERENCE STANDARDS

- A. 47 CFR 15 - Radio Frequency Devices.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- C. NECA 130 - Standard for Installing and Maintaining Wiring Devices.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- E. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts.
- F. NFPA 70 - National Electrical Code (NEC).
- G. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control.
- H. UL 916 - Energy Management Equipment.
- I. UL 1472 - Solid-State Dimming Controls.
- J. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules.
- K. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
 - 3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
 - 4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
 - 5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
- B. Sequencing:
 - 1. Do not install lighting control devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

- A. Submit material list in accordance with Section 26 00 01, describing all material furnished under Part 2 of this Section of the Specifications.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
 - 1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.
- C. Shop Drawings:
 - 1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
 - 2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.
- D. Field Quality Control Reports.
- E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Operation and Maintenance Data: Include detailed information on device programming and setup.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
- H. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of the NEC.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND PROTECTION

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.8 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five (5) year manufacturer warranty for all occupancy sensors.
- C. Provide two (2) year manufacturer warranty for all daylighting controls.

PART 2 - PRODUCTS

2.1 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.
- C. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.2 OCCUPANCY SENSORS

- A. Manufacturers:
 - 1. Hubbell Incorporated.
 - 2. Lutron Electronics Company, Inc.
 - 3. Sensor Switch Inc.
 - 4. WattStopper.
 - 5. Substitutions: Approved substitute.
 - 6. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. All Occupancy Sensors:
 - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
 - 2. Sensor Technology:
 - a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
 - b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
 - c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
 - d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.
 - 3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
 - 4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
 - 5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
 - 6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
 - 7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
 - 8. Sensitivity: Field adjustable.
 - 9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.

10. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.
 11. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
 12. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.
 13. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.
- C. Wall Switch Occupancy Sensors:
1. All Wall Switch Occupancy Sensors:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
 - b. Unless otherwise indicated or required to control the load indicated on drawings, provide line voltage units with self-contained relay.
 - c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.
 - d. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
 - e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
 - f. Provide selectable audible alert to notify occupant of impending load turn-off.
 - g. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.
 - h. Provide vandal resistant lenses for passive infrared (PIR) and dual technology wall switch occupancy sensors where indicated.
 2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).
 - a. Products:
 - 1) Lutron Maestro Series.
 - 2) Substitutions: Approved substitute.
 3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 400 square feet (37.2 sq m).
 4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).
 - a. Products:
 - 1) Lutron Maestro Series.
 - 2) Substitutions: Approved substitute.
- D. Wall Dimmer Occupancy Sensors:
1. General Requirements:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.
 - b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
 - c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
 - d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
 - e. Provide field adjustable dimming preset for occupied state.
 - f. Provide fade-to-off operation to notify occupant of impending load turn-off.
 - g. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.

2. Passive Infrared (PIR) Wall Dimmer Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).

- a. Products:

- 1) Lutron Maestro C.L Sensor Dimmer Series; www.lutron.com/#sle.
- 2) Lutron Maestro Occupancy Sensor Dimmer Series; www.lutron.com/#sle.
- 3) Lutron Maestro 0-10V Dimmer Sensor Series; www.lutron.com/#sle.
- 4) Substitutions: Approved substitute.

E. Ceiling Mounted Occupancy Sensors:

1. All Ceiling Mounted Occupancy Sensors:

- a. Description: Low profile occupancy sensors designed for ceiling installation.
- b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
- c. Provide field selectable setting for disabling LED motion detector visual indicator.
- d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
- e. Finish: White unless otherwise indicated.

2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:

- a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 square meters) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

- 1) Products:

- (a) Lutron LOS-CIR Series.
- (b) Lutron Radio Powr Savr Wireless Sensors.
- (c) Substitutions: Approved substitute.

- b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet (111.5 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

- 1) Products:

- (a) Lutron LOS-CIR Series.
- (b) Substitutions: Approved substitute.

3. Ultrasonic Ceiling Mounted Occupancy Sensors:

- a. Standard Range Sensors: Capable of detecting motion within an area of 500 square feet (46.5 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

- 1) Products:

- (a) Lutron LOS-CUS Series.
- (b) Substitutions: Approved substitute.

- b. Medium Range Sensors: Capable of detecting motion within an area of 1,000 square feet (92.9 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

- 1) Products:

- (a) Lutron LOS-CUS Series.
- (b) Substitutions: Approved substitute.

- c. Extended Range Sensors: Capable of detecting motion within an area of 2,000 square feet (185.8 sq m) at a mounting height of 9 feet (2.7 m).

- 1) Products:

- (a) Lutron LOS-CUS Series.
- (b) Substitutions: Approved substitute.

4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:

- a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

- 1) Products:

- (a) Lutron LOS-CDT Series.
- (b) Substitutions: Approved substitute.

- b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet (111.5 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

- 1) Products:

- (a) Lutron LOS-CDT Series.
- (b) Substitutions: Approved substitute.

5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:

- a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
 - 1) Products:
 - (a) Substitutions: Approved substitute.
 - b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet (111.5 sq m) at a mounting height of 9 feet (2.7 m).
 - 1) Products:
 - (a) Substitutions: Approved substitute.
- F. Directional Occupancy Sensors:
1. All Directional Occupancy Sensors: Designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
 - a. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
 - b. Provide field selectable setting for disabling LED motion detector visual indicator.
 - c. Finish: White unless otherwise indicated.
 2. Passive Infrared (PIR) Directional Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within a distance of 40 feet (12 m) at a mounting height of 10 feet (3.1 m).
 - 1) Products:
 - (a) Lutron LOS-WIR Series.
 - (b) Lutron Radio Powr Savr Wireless Sensors.
 - (c) Substitutions: Approved substitute.
 - b. Long Range Sensors: Capable of detecting motion within a distance of 80 feet (24 m) at a mounting height of 10 feet (3.1 m).
 - 1) Products:
 - (a) Lutron Radio Powr Savr Wireless Sensors.
 - (b) Substitutions: Approved substitute.
 - c. High Bay Sensors: Capable of detecting motion within a distance of 50 feet (15 m) at a mounting height of 30 feet (9.1 m).
 - 1) Products:
 - (a) Substitutions: Approved substitute.
 3. Passive Infrared/Ultrasonic Dual Technology Directional Occupancy Sensors: Capable of detecting motion within a distance of 40 feet (12 m) at a mounting height of 10 feet (3.1 m).
 - a. Products:
 - 1) Lutron LOS-WDT Series.
 - (a) Substitutions: Approved substitute.
- G. Power Packs for Low Voltage Occupancy Sensors:
1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
 2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
 3. Input Supply Voltage: Dual rated for 120/277 VAC.
 4. Load Rating: As required to control the load indicated on drawings.
- H. Accessories:
1. Provide heavy duty coated steel wire protective guards compatible with specified occupancy sensors where indicated.

2.3 OUTDOOR PHOTO CONTROLS

- A. Manufacturers:
1. Intermatic, Inc.
 2. Tork, a division of NSI Industries LLC.
 3. Substitutions: Approved substitute.
 4. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

- B. Stem-Mounted Outdoor Photo Controls:
 - 1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
 - 2. Housing: Weatherproof, impact resistant polycarbonate.
 - 3. Photo Sensor: Cadmium sulfide.
 - 4. Provide external sliding shield for field adjustment of light level activation.
 - 5. Light Level Activation: 1 to 5 footcandles (10.8 to 53.8 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
 - 6. Voltage: As required to control the load indicated on the drawings.
 - 7. Failure Mode: Fails to the on position.
 - 8. Load Rating: As required to control the load indicated on the drawings.
 - 9. Provide accessory wall-mounting bracket where indicated or as required to complete installation.
- C. Button Type Outdoor Photo Controls
 - 1. Description: Direct-wired photo control unit complying with ANSI C136.24 with weatherproof gasketed wall plate where required or indicated, listed and labeled as complying with UL 773A.
 - 2. Housing: Weather resistant polycarbonate.
 - 3. Photo Sensor: Cadmium sulfide.
 - 4. Light Level Activation: 1 to 3 footcandles (10.8 to 32.3 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
 - 5. Voltage: As required to control the load indicated on the drawings.
 - 6. Failure Mode: Fails to the on position.
 - 7. Load Rating: As required to control the load indicated on the drawings.

2.4 DAYLIGHTING CONTROLS

- A. Manufacturers:
 - 1. Hubbell Control Solutions.
 - 2. Lutron Electronics Company, Inc.
 - 3. Sensor Switch Inc.
 - 4. WattStopper.
 - 5. Substitutions: Approved substitute.
 - 6. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.
- C. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.
 - 1. Sensor Type: Filtered silicon photo diode.
 - 2. Sensor Range:
 - a. Indoor Photo Sensors: 5 to 100 footcandles (53.8 to 1,080 lx).
 - b. Outdoor Photo Sensors: 5 to 250 footcandles (53.8 to 2690 lx).
 - c. Atrium Photo Sensors: 200 to 2,500 footcandles (2150 to 2,6910 lx).
 - d. Skylight Photo Sensors: 1,000 to 6,000 footcandles (10,760 to 64,580 lx).
 - e. Open Loop Photo Sensors: 3 to 6,000 footcandles (32.3 to 64,580 lx).
 - 3. Finish: White unless otherwise indicated.
 - 4. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.
 - 5. Wireless Daylighting Control Photo Sensors:
 - a. RF Range: 30 feet (9 m) through typical construction materials.
 - b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
 - c. Power: Battery-operated with minimum ten-year battery life.
 - d. Products:
 - 1) Lutron Radio Powr Savr Wireless Sensors.

2) Substitutions: Approved substitute.

- D. Dimming Photo Sensors: Photo sensor units with integral controller compatible with specified dimming ballasts, for direct continuous dimming of up to 50 ballasts.
- E. Daylighting Control Switching Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors, for switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
1. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
 2. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
 3. Control Capability:
 - a. Single Zone Switching Modules: Capable of controlling one programmable channel.
 - b. Multi-Zone Switching Modules: Capable of controlling up to three separately programmable channels.
- F. Daylighting Control Switching Modules for Wireless Sensors:
1. Description: Plenum rated, self-contained relay compatible with specified wireless photo sensors for switching of line voltage loads in response to changes in measured light levels according to selected settings.
 2. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
 3. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
 4. Control Capability: Capable of controlling one programmable channel.
 5. Input Supply Voltage: Dual rated for 120/277 VAC.
 6. Load Rating: As required to control the load indicated on drawings.
 7. Provide auxiliary contact closure output where indicated.
 8. Rated Life of Relay: One million cycles.
 9. Products:
 - a. Lutron PowPak Relay Module.
 - b. Substitutions: Approved substitute.
- G. Daylighting Control Dimming Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors and with specified dimming ballasts, for both continuous dimming of compatible dimming ballasts and switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
1. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
 2. Load to be turned off when available daylight is sufficient to fully dim the load, after the selected time delay.
 3. Control Capability: Capable of controlling up to three separately programmable channels, with up to 50 ballasts per channel.
 4. Dimming and Fade Rates: Adjustable from 5 to 60 seconds.
 5. Cut-Off Delay: Selectable and adjustable from 0 to 20 minutes.
 6. Output Voltage: Compatible with specified dimming ballasts.
- H. Daylighting Control Dimming Modules for Wireless Sensors:
1. Description: Plenum rated control unit compatible with specified wireless photo sensors and with specified dimming ballasts, for continuous dimming of compatible dimming ballasts in response to changes in measured light levels according to selected settings.
 2. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
 3. Load to be turned off when available daylight is sufficient to fully dim the load, after the selected time delay.
 4. Control Capability: Capable of controlling up to 32 ballasts with up to two separately programmable daylighting zones.
 5. Products:
 - a. Lutron PowPak Dimming Module.
 - b. Substitutions: Approved substitute.

- I. Power Packs for Low Voltage Daylighting Control Modules:
 - 1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage daylighting control modules for switching of line voltage loads. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
 - 2. Input Supply Voltage: Dual rated for 120/277 VAC.
 - 3. Load Ratings: As required to control the load indicated on drawings.
- J. Accessories:
 - 1. Where indicated, provide compatible accessory wall switches for manual override control.
 - 2. Where indicated, provide compatible accessory wireless controls for manual override control.
 - a. Products:
 - 1) Lutron Pico Wireless Controls; www.lutron.com/#sle.
 - 2) Substitutions: See Section 01 6000 - Product Requirements.

2.5 LIGHTING CONTACTORS

- A. Manufacturers:
 - 1. ABB/GE.
 - 2. Eaton Corporation.
 - 3. Rockwell Automation Inc; Allen-Bradley Products.
 - 4. Schneider Electric; Square D Products.
 - 5. Siemens Industry, Inc.
 - 6. Substitutions: Approved substitute.
- B. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on the drawings.
- C. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactor(s) and externally operable disconnect.
 - 1. Disconnects: Circuit breaker or disconnect switch type as indicated..
 - a. Disconnect Switches: Fusible type unless otherwise indicated.
 - b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
 - c. Provide auxiliary interlock for disconnection of external control power sources where applicable.
- D. Short Circuit Current Rating:
 - 1. Provide contactors with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- E. Enclosures:
 - 1. Comply with NEMA ICS 6.
 - 2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1 or Type 12.
 - b. Outdoor Locations: Type 3R or Type 4.
 - 3. Finish: Manufacturer's standard unless otherwise indicated.

2.6 LED CONTROLLERS

- A. Manufacturers:
 - 1. Acuity Brands EasyL.
 - 2. EldoLED.
- B. Description: RGB lighting control and touchscreen display panel. Interface with LED Linear fixtures utilizing DMX controls driver and EasyL touchscreen wall control.

2.7 ACCESSORIES

- A. Auxiliary Contacts:
 - 1. Comply with NEMA ICS 5.
 - 2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each lighting contactor, minimum.
- B. Pilot Devices:
 - 1. Comply with NEMA ICS 5; heavy-duty type.
 - 2. Nominal Size: 30 mm.
 - 3. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.
 - 4. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
 - 5. Indicating Lights: Push-to-test type unless otherwise indicated.
 - 6. Provide LED lamp source for indicating lights and illuminated devices.
- C. Control and Timing Relays:
 - 1. Comply with NEMA ICS 5.
 - 2. Provide number and type of relays indicated or required to perform necessary functions.
 - 3. Timing Relays: Electronic or pneumatic as indicated.
 - a. Adjustable Timing Range: As indicated on drawings.
- D. Fire-Rated Device Enclosures:
 - 1. Manufacturers:
 - a. Fire Rated Product Specialties Corp.
 - b. Substitutions: Approved substitute.
 - 2. Provide as required to preserve fire resistance rating of building elements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with the NEC.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

-
- B. Install lighting control relays furnished under Section 25 36 26
 - C. Coordinate locations of outlet boxes provided under Section 26 05 33 as required for installation of lighting control devices provided under this section.
 - 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switch Occupancy Sensors: 48 inches (1.2 m) above finished floor.
 - b. In-Wall Time Switches: 48 inches (1.2 m) above finished floor.
 - c. In-Wall Interval Timers: 48 inches (1.2 m) above finished floor.
 - 2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
 - 3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
 - D. Install lighting control devices in accordance with manufacturer's instructions.
 - E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 - F. Install lighting control devices plumb, level, and held securely in place.
 - G. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.
 - H. Provide required supports in accordance with Section 26 05 29.
 - I. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
 - J. Identify lighting control devices in accordance with Section 26 05 53.
 - K. Occupancy Sensor Locations:
 - 1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
 - 2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
 - L. Outdoor Photo Control Locations:
 - 1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
 - 2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.
 - M. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.
 - N. Daylighting Control Photo Sensor Locations:
 - 1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for proper control of respective room or area based on manufacturer's recommendations for installed devices.
 - 2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
 - 3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.
 - O. Combination Enclosed Lighting Contactors:

1. Except where indicated to be mounted adjacent to the equipment they supply, mount lighting contactors such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
 2. Provide fuses complying with Section 26 28 13 for fusible switches as indicated.
- P. LED Controllers:
1. Verify with owner location of touchscreen control for RGB LEDs.
 2. Install system complete with all necessary DMX cabling and programming.
 3. RGB LEDs shall be capable of being controlled with owner furnished computer as well as wall touchscreen controller. Provide software and training for owner.
- Q. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
- R. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.
- S. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.
- T. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.
- U. Where indicated or required, provide cabinet or enclosure in accordance with Section 26 05 33 for mounting of lighting control device system components.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- D. Test time switches to verify proper operation.
- E. Test outdoor photo controls to verify proper operation, including time delays where applicable.
- F. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.
- G. Test RGB controls to verify proper operation.
- H. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.5 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
- C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.
- D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
- E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect. Record settings in written report to be included with submittals.

- F. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.
- G. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.6 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.7 COMMISSIONING

- A. See Section 01 91 13 - General Commissioning Requirements for commissioning requirements.

3.8 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.
- D. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.
 - 3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
 - 4. Location: At project site.

END OF SECTION

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SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Lighting and appliance panelboards

1.2 RELATED SECTIONS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems
- C. Section 26 05 53 - Identification for Electrical Systems
- D. Section 26 43 00 - Surge Protective Devices

1.3 REFERENCES

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction
- C. NECA 407 - Standard for Installing and Maintaining Panelboards
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
- E. NEMA PB 1 - Panelboards
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less
- G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations
- K. UL 67 - Panelboards
- L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures
- M. UL 943 - Ground-Fault Circuit-Interrupters
- N. UL 1053 - Ground-Fault Sensing and Relaying Equipment

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by the NEC.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

- A. Submit shop drawings and product data for equipment and component devices under provisions of Section 26 00 01.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
 1. Include characteristic trip curves for each type and rating of overcurrent protective device.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
 2. Include wiring diagrams showing all factory and field connections.
 3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
 4. Include documentation of listed series ratings upon request.
 5. Identify mounting conditions required for equipment seismic qualification.
- D. Manufacturer's equipment seismic qualification certification.
- E. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.
- F. Field Quality Control Test Reports.
- G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- I. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
 - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Listed as compatible with existing panelboard

2.2 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- C. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
 - 1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
 - 2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
 - a. Use zero sequence ground fault detection method unless otherwise indicated.
 - b. Provide test panel and field-adjustable ground fault pick-up and delay settings.
 - c. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control ground fault delay functions for system coordination purposes.

2.3 PANELBOARDS AND CABINETS (REMODELING, CIRCUIT BREAKERS ONLY)

- A. Modify existing power and lighting panelboards and cabinets indicates on the drawings and further specified herein. All circuit breakers shall be UL list with the existing panelboards.
- B. Provide circuit breakers as indicated on Drawings. Breakers shall be molded case, non-adjustable, thermal-magnetic, quick-make, quick-break, bolt-on type. Provide multipole breakers where required. Handle ties are not acceptable.

2.4 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
 - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 - 2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - 2) 14,000 rms symmetrical amperes at 480 VAC.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 - 3. Conductor Terminations:

- a. Provide mechanical lugs unless otherwise indicated.
- b. Provide compression lugs where indicated.
- c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 100 amperes and larger.
 - b. Provide interchangeable trip units where indicated.
5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
 - a. Provide the following field-adjustable trip response settings:
 - 1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
 - 2) Long time delay.
 - 3) Short time pickup and delay.
 - 4) Instantaneous pickup.
 - 5) Ground fault pickup and delay where ground fault protection is indicated.
 - b. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control short time delay and ground fault delay functions for system coordination purposes.
 - c. Provide communication capability where indicated: Compatible with system indicated.
6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
7. Provide the following circuit breaker types where indicated:
 - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
 - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
 - c. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
 - d. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.
8. Do not use tandem circuit breakers.
9. Do not use handle ties in lieu of multi-pole circuit breakers.
10. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

2.5 SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Factory test panelboards according to NEMA PB 1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.

- C. Provide grounding and bonding in accordance with Section 26 05 26.
 - 1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only.
- D. Install all field-installed branch devices, components, and accessories.
- E. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- F. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by the NEC.
- G. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- H. Provide filler plates to cover unused spaces in panelboards.
- I. Identify panelboards in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Test GFCI circuit breakers to verify proper operation.
- D. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing:
 - 1. For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.
 - 2. When connecting loads to a distribution panel, distribute the loads on the phases to achieve an approximately balanced loading. Measure the steady state load currents at each panelboard feeder and rearrange circuits if there is greater than a 10% difference between phases.
- D. Measure the current on each leg at each panelboard after the current loads are balanced. Record the measured values on the project record drawings.

3.5 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

3.6 IDENTIFICATION

- A. Provide "nameplates" as specified in Section 26 05 53 for all panelboards. Label as indicated on the Drawings.

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SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Section 26 00 01 – General Provisions
- B. Section 26 05 19 – Conductors and Cable
- C. Section 26 05 26 – Secondary Grounding
- D. Section 26 05 33 – Raceways and Boxes
- E. Section 26 05 53 – Identification for Electrical Systems
- F. Section 26 05 83 – Wiring Connections.
- G. Section 26 09 23 – Lighting Control Devices
- H. Section 26 29 13 – Motor Starters

1.2 REFERENCES

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices.
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications.
- G. NFPA 70 - National Electrical Code (NEC).
- H. UL 20 - General-Use Snap Switches.
- I. UL 498 - Attachment Plugs and Receptacles.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices.
- K. UL 943 - Ground-Fault Circuit-Interrupters.
- L. UL 1310 - Class 2 Power Units.
- M. UL 1449 - Standard for Surge Protective Devices.
- N. UL 1472 - Solid-State Dimming Controls.
- O. UL 1917 - Solid-State Fan Speed Controls.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
 - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
 - 4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
 - 5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.

6. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.4 SUBMITTALS

A. Submit material list in accordance with Section 26 00 01, describing all material furnished under Part 2 of this Section of the Specifications.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1. Surge Protection Receptacles: Include surge current rating, voltage protection rating (VPR) for each protection mode, and diagnostics information.

C. Samples: One for each type and color of device and wall plate specified.

D. Certificates for Surge Protection Receptacles: Manufacturer's documentation of listing for compliance with UL 1449.

E. Field Quality Control Test Reports.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data:

1. GFCI Receptacles: Include information on status indicators.

2. Surge Protection Receptacles: Include information on status indicators.

H. Project Record Documents: Record actual installed locations of wiring devices.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Screwdrivers for Tamper-Resistant Screws: Two for each type of screw.

3. Extra Keys for Locking Switches: Two of each type.

4. Extra Surge Protection Receptacles: Two of each type.

5. Extra Wall Plates: One of each style, size, and finish.

1.5 QUALITY ASSURANCE

A. Comply with requirements of the NEC.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 - PRODUCTS

2.1 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- D. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.
- E. Provide GFCI circuit breaker ONLY for standard receptacles serving electric water coolers / drinking fountains. (Coordinate receptacle locations with mechanical contractor prior to rough-in.)
- F. Unless noted otherwise, do not use combination switch/receptacle devices.

2.2 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: Gray with Stainless Steel wall plate.
- C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
- D. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.
- E. Surge Protection Receptacles: Blue.

2.3 WALL SWITCHES

- A. Manufacturers:
 - 1. Hubbell Incorporated
 - 2. Leviton Manufacturing Company, Inc
 - 3. Pass & Seymour, a brand of Legrand North America, Inc
 - 4. Accepted substitute.
- B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- D. Lighted Wall Switches: Industrial specification grade, 20 A, 120/277 V with illuminated standard toggle type switch actuator and maintained contacts; illuminated with load off; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- E. Pilot Light Wall Switches: Industrial specification grade, 20 A, 120/277 V with red illuminated standard toggle type switch actuator and maintained contacts; illuminated with load on; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- F. Locking Wall Switches: Industrial specification grade, 20 A, 120/277 V with lever type keyed switch actuator and maintained contacts; switches keyed alike; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- G. Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with toggle type three position switch actuator and momentary contacts; single pole double throw, off with switch actuator in center position.
- H. Locking Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with lever type keyed three position switch actuator and momentary contacts; switches keyed alike; single pole double throw, off with switch actuator in center position.

2.4 RECEPTACLES

- A. Manufacturers:
 - 1. Hubbell Incorporated;
 - 2. Leviton Manufacturing Company, Inc; CR20-? (finish).
 - 3. Lutron Electronics Company, Inc; Designer Style.
 - 4. Pass & Seymour, a brand of Legrand North America, Inc;
 - 5. Approved substitute.
 - 6. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wall plates by the same manufacturer in locations indicated.

- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
 - 2. NEMA configurations specified are according to NEMA WD 6.

- C. Convenience Receptacles:
 - 1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
 - 2. Automatically Controlled Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; controlled receptacle marking on device face per NFPA 70; single or duplex as indicated on the drawings.
 - 3. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
 - 4. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
 - 5. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
 - 6. Illuminated Convenience Receptacles: Hospital grade, 20A, 125V, NEMA 5-20R; illuminated face or indicator light to indicate power is being supplied to receptacle; single or duplex as indicated on the drawings.

- D. GFCI Receptacles:
 - 1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
 - a. Provide test and reset buttons of same color as device.
 - 2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
 - 3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
 - 4. 4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
 - 5. 5. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

- E. USB Charging Devices:
 - 1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
 - a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.
 - b. Charging Capacity - Four-Port Devices: 4.2 A, minimum.

2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.
 3. USB Charging Noncombination Devices: Four-port (Type A); rectangular decorator style.
- F. Surge Protection Receptacles:
1. Surge Protection Receptacles - General Requirements: Listed and labeled as complying with UL 1449, Type 2 or 3.
 - a. Energy Dissipation: Not less than 240 J per mode.
 - b. Protected Modes: L-N, L-G, N-G.
 - c. UL 1449 Voltage Protection Rating (VPR): Not more than 700 V for L-N, L-G modes and 1200 V for N-G mode.
 - d. Diagnostics:
 - 1) Visual Notification: Provide indicator light to report functional status of surge protection.
 - 2) Audible Notification: Provide switchable audible alarm to report that surge protection is not functional.
 2. Standard Surge Protection Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
- G. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.
1. Standard Locking Convenience Receptacles: Single, 20A, 125V, NEMA L5-20R.

2.5 WALL PLATES

- A. Manufacturers:
1. Hubbell Incorporated
 2. Leviton Manufacturing Company, Inc
 3. Lutron Electronics Company, Inc
 4. Pass & Seymour, a brand of Legrand North America, Inc
 5. Approved substitute.
 6. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wall plates by the same manufacturer in locations indicated.
- B. Wall Plates: Comply with UL 514D.
1. Configuration: One-piece cover as required for quantity and types of corresponding wiring devices.
 2. Size: Standard.
 3. Screws: Metal with slotted heads finished to match wall plate finish.
- C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- E. Aluminum Wall Plates: Smooth satin finish, clear anodized, factory-coated to inhibit oxidation.
- F. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.
- G. Pre-marked Wall Plates: Factory labeled as indicated; hot stamped for nylon wall plates and engraved for metal wall plates.
- H. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, or Lexan, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.
- I. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, or Lexan, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.
- J. Weatherproof boots: Yellow rubber, with overlapping design to seal out water and dirt. Rubber boot shall keep weatherproof seal intact when plug is used with wall mounted receptacles.

2.6 HAZARDOUS AREAS

- A. All wiring, devices, outlets, and lighting fixtures in hazardous areas shall be installed in accordance with NEC requirements for that classification of hazardous locations. All devices and equipment shall be listed for use in this type of location.
- B. Where it is necessary to install sealing fittings accessible from rooms or areas which are finished, a flush wall or ceiling outlet box is to be installed and the conduit to be sealed run straight through the box with the sealing fitting occurring within the outlet box. The box shall then be covered with blank plate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 05 33 as required for installation of wiring devices provided under this section.
 - 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switches: 48 inches (1200 mm) above finished floor.
 - b. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
 - 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
 - 3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
 - 4. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
 - 5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.
- J. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- K. Install wall switches with OFF position down.
- L. Install vertically mounted receptacles with grounding pole on bottom and horizontally mounted receptacles with grounding pole on right.
- M. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- N. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- O. Identify wiring devices in accordance with Section 26 05 53.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Inspect each surge protection receptacle to verify surge protection is active.
- G. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

3.6 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

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SECTION 26 28 13 - FUSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fuses.

1.2 RELATED REQUIREMENTS

- A. Section 26 00 01 - General Provisions
- B. Section 26 05 53 - Identification for Electrical Systems.
- C. Section 26 28 16 - Enclosed Switches: Fusible switches.
- D. Section 26 29 13 - Enclosed Controllers: Fusible switches.

1.3 REFERENCE STANDARDS

- A. NEMA FU 1 - Low Voltage Cartridge Fuses.
- B. NFPA 70 - National Electrical Code (NEC).
- C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements.
- D. UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses.
- E. UL 248-8 - Low-Voltage Fuses - Part 8: Class J Fuses.
- F. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses.
- G. UL 248-15 - Low-Voltage Fuses - Part 15: Class T Fuses.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
 - a. Fusible Enclosed Switches: See Section 26 28 16.
 - b. Fusible Switches for Enclosed Motor Controllers: See Section 26 29 13.
 - 2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
 - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

- A. Submit material list in accordance with Section 26 00 01, describing all material furnished under Part 2 of this Section of the Specifications.
- B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.
 - 1. Spare Fuse Cabinet: Include dimensions.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Fuses: One set(s) of three for each type and size installed.
 - 3. Fuse Pullers: One set(s) compatible with each type and size installed.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of the NEC.

- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 TIME-CURRENT DATA

- A. Submit "time-current data" with shop drawings for main switchboard overcurrent device, all distribution fuses, and all ground-fault interrupters. The Engineer shall indicate the proper trip settings on the shop drawings during review. The Contractor shall be responsible for adjusting "trip settings" as indicated by the Engineer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Bussmann, a division of Eaton Corporation.
- B. Littelfuse, Inc.
- C. Mersen.
- D. Approved substitute.

2.2 APPLICATIONS

- A. Feeders:
 - 1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
- B. General Purpose Branch Circuits: Class RK1, time-delay.
- C. Individual Motor Branch Circuits: Class RK1, time-delay.
- D. In-Line Protection for Pole-Mounted Luminaires: Class CC, time-delay.
- E. Primary Protection for Control Transformers: Class CC, time-delay.

2.3 FUSES

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C. Provide fuses of the same type, rating, and manufacturer within the same switch.
- D. Comply with UL 248-1.
- E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Class R Fuses: Comply with UL 248-12.
 - 1. Class RK1, Time-Delay Fuses:
 - a. Products (Bussmann used as reference):
 - 1) LPN-RK.
 - 2) LPS-RK.
 - 3) Approved substitute.
- H. Class J Fuses: Comply with UL 248-8.
 - 1. Class J, Time-Delay Fuses:
 - a. Products (Bussmann used as reference):
 - 1) LPJ.

2) Approved substitute.

- I. Class CC Fuses: Comply with UL 248-4.
 - 1. Class CC, Time-Delay Fuses:
 - 2. Class CC, Fast-Acting, Non-Time-Delay Fuses:
- J. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- K. Provide the following accessories where indicated or where required to complete installation:
 - 1. Fuse Holders: Compatible with indicated fuses.
 - 2. Fuse Reducers: For adapting indicated fuses to permit installation in switch designed for fuses with larger ampere ratings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.
- B. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Do not install fuses until circuits are ready to be energized.
- B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

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SECTION 26 28 16 - DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Section 26 00 01 – General Provisions
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 53 - Identification for Electrical Systems.
- E. Section 26 28 13 - Fuses.
- F. Section 26 29 13 - Enclosed Controllers.

1.2 REFERENCES

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- D. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum).
- E. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems.
- F. NFPA 70 - National Electrical Code (NEC).
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.
- I. UL 98 - Enclosed and Dead-Front Switches.
- J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.
- K. UL 869A - Reference Standard for Service Equipment.
- L. UL 943 - Ground-Fault Circuit-Interrupters.
- M. UL 1053 - Ground-Fault Sensing and Relaying Equipment.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by the NEC.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.4 SUBMITTALS

- A. Submit product data (product drawings and descriptive data) in accordance with Section 26 00 01, Paragraph 1.4 "Submittals" describing all material furnished under Part 2 of this Section of the Specifications.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

- C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 - 1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.
 - 2. Include wiring diagrams showing all factory and field connections.
 - 3. Identify mounting conditions required for equipment seismic qualification.
- D. Manufacturer's equipment seismic qualification certification.
- E. Field Quality Control Test Reports.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- G. Project Record Documents: Record actual locations of enclosed switches.
- H. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

1.5 QUALITY ASSURANCE

- A. Comply with requirements of the NEC.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperature between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed switches.

1.8 TIME-CURRENT DATA

- A. Submit "time-current data" with shop drawings for all overcurrent devices. The Engineer shall indicate the proper trip settings on the shop drawings during review. The Contractor shall be responsible for adjusting "trip settings" as indicated by the Engineer.

PART 2 - EQUIPMENT

2.1 MANUFACTURERS

- A. Schneider Electric; Square D Products.
- B. Allen-Bradley

- C. Eaton Corporation.
- D. ABB/GE.
- E. Siemens Industry, Inc.
- F. Approved substitute.
- G. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
 - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
 - 2. Minimum Ratings:
 - a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
 - b. General Duty Single Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
 - c. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
 - d. Double Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
- G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- H. Provide with switch blade contact position that is visible when the cover is open.
- I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
 - 1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- J. Conductor Terminations: Suitable for use with the conductors to be installed.
- K. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- L. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- M. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 - 2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

- N. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- O. Heavy Duty Switches:
 - 1. Comply with NEMA KS 1.
 - 2. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Provide compression lugs where indicated.
 - c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
 - a. Provide means for locking handle in the ON position where indicated.
- P. General Duty Switches:
 - 1. Conductor Terminations:
 - a. Provide mechanical lugs.
 - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 2. Provide externally operable handle with means for locking in the OFF position, capable of accepting two padlocks.
- Q. Provide the following features and accessories where indicated or where required to complete installation:
 - 1. Hubs: As required for environment type; sized to accept conduits to be installed.
 - 2. Integral fuse pullers.
 - 3. Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close.
 - 4. Viewing Window: Positioned over switch blades for visual confirmation of contact position with door closed.
 - 5. Interlocked Receptacle: Integral pre-wired three phase, three wire, grounded type receptacle interlocked with switch mechanism to prevent insertion or removal of plug with switch in the ON position and to prevent switch from being placed in the ON position without matching plug inserted. Provide receptacle configuration as required to accept plug as indicated on the drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and the NEC.
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 05 26.

- H. Install fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- J. Identify enclosed switches in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.4 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

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SECTION 26 29 13 - MOTOR STARTERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Enclosed NEMA controllers for low-voltage (600 V and less) applications:
 - 1. Magnetic motor starters.
 - 2. General purpose contactors.
 - 3. Manual motor starters.
 - 4. Motor-starting switches without overload protection.
- B. Overcurrent protective devices for motor controllers, including overload relays.
- C. Control accessories:
 - 1. Auxiliary contacts.
 - 2. Pilot devices.
 - 3. Control and timing relays.
 - 4. Control power transformers.
 - 5. Control terminal blocks.

1.2 RELATED REQUIREMENTS

- A. Section 26 05 26 – Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 – Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 – Identification for Electrical Systems.
- D. Section 26 28 13 – Fuses.

1.3 REFERENCE STANDARDS

- A. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.
- E. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
- F. NEMA ICS 6 - Industrial Control and Systems: Enclosures.
- G. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum).
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems.
- I. NFPA 70 - National Electrical Code (NEC).
- J. UL 98 - Enclosed and Dead-Front Switches.
- K. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.
- L. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules.
- M. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by the NEC.

2. Coordinate the work to provide motor controllers and associated overload relays suitable for use with the actual motors to be installed.
3. Coordinate the work to provide controllers and associated wiring suitable for interface with control devices to be installed.
4. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
5. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
6. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

- A. Submit shop drawings and product data under the provisions of Section 26 00 01.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.
 1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- C. Shop Drawings: Indicate dimensions, voltage, controller sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 1. Include dimensioned plan and elevation views of enclosed controllers and adjacent equipment with all required clearances indicated.
 2. Include wiring diagrams showing all factory and field connections.
 3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
 4. Include documentation of listed series ratings upon request.
 5. Include documentation demonstrating selective coordination upon request.
 6. Identify mounting conditions required for equipment seismic qualification.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Field Quality Control Test Reports.
- F. Project Record Documents: Record actual installed locations of controllers and final equipment settings.
 1. Include nameplate data of actual installed motors and associated overload relay selections and settings.
 2. Motor Circuit Protectors: Include magnetic instantaneous trip settings.
- G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Electronic Trip Circuit Breakers: Provide one portable test set.
 3. Indicating Lights: Two of each different type.
 4. See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of the NEC.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

- A. Maintain field conditions within required service conditions during and after installation.

PART 2 - EQUIPMENT

2.1 MANUFACTURERS

- A. ABB/GE.
- B. Eaton Corporation.
- C. Rockwell Automation, Inc; Allen-Bradley Products.
- D. Schneider Electric; Square D Products.
- E. Siemens Industry, Inc.
- F. Substitutions: Approved Substitute.
- G. Source Limitations: Furnish enclosed motor controllers and associated components produced by a single manufacturer and obtained from a single supplier.
 - 1. Motor-starting switches without overload protection may be produced by the same manufacturer as the wiring devices used for this project.

2.2 ENCLOSED CONTROLLERS

- A. Provide enclosed controller assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Description: Enclosed controllers complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; ratings, configurations and features as indicated on the drawings.
- D. Service Conditions:
 - 1. Provide controllers and associated components suitable for operation under the following service conditions without derating:
 - a. Altitude:
 - 1) Class 1 Km Equipment (devices utilizing power semiconductors, e.g. variable frequency controllers):
Less than 3,300 feet (1,000 m).
 - 2) Class 2 Km Equipment (electromagnetic and manual devices): Less than 6,600 feet (2,000 m).
 - b. Ambient Temperature: Between 32 degrees F (0 degrees C) and 104 degrees F (40 degrees C).
- E. Short Circuit Current Rating:
 - 1. Provide controllers with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 - 2. Label equipment utilizing series ratings as required by the NEC.
- F. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures:

1. Comply with NEMA ICS 6.
 2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1 or Type 12.
 - b. Outdoor Locations: Type 3R or Type 4.
 - c. Hazardous (Classified) Locations: Type 7/9, as required for the classification of the installed location.
 3. Finish: Manufacturer's standard unless otherwise indicated.
- I. Instrument Transformers:
1. Comply with IEEE C57.13.
 2. Select suitable ratio, burden, and accuracy as required for connected devices.
 3. Current Transformers: Connect secondaries to shorting terminal blocks.
 4. Potential Transformers: Include primary and secondary fuses with disconnecting means.
- J. Magnetic Motor Starters: Combination type unless otherwise indicated.
1. Combination Magnetic Motor Starters: NEMA ICS 2, Class A combination motor controllers with magnetic contactor(s), externally operable disconnect and overload relay(s).
 2. Noncombination Magnetic Motor Starters: NEMA ICS 2, Class A noncombination motor controllers with magnetic contactor(s) and overload relay(s).
 3. Configuration: Full-voltage non-reversing unless otherwise indicated.
 4. Minimum Starter Size: NEMA Size 0.
 5. Use of non-standard starter sizes smaller than specified standard NEMA sizes is not permitted.
 6. Disconnects: Circuit breaker or disconnect switch type as indicated.
 - a. Circuit Breakers: Motor circuit protectors (magnetic-only) unless otherwise indicated or required.
 - b. Disconnect Switches: Fusible type unless otherwise indicated.
 - c. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
 - d. Provide auxiliary interlock for disconnection of external control power sources where applicable.
 7. Overload Relays: Bimetallic thermal type unless otherwise indicated.
 8. Pilot Devices Required:
 - a. Furnish local pilot devices for each unit as specified below unless otherwise indicated on drawings.
 - b. Single-Speed, Non-Reversing Starters:
 - 1) Pushbuttons: START-STOP.
 - 2) Selector Switches: HAND/OFF/AUTO.
 - 3) Indicating Lights: Red ON, Green OFF.
 - c. Single-Speed, Reversing Starters:
 - 1) Pushbuttons: FOR-REV-STOP.
 - 2) Selector Switches: FOR/OFF/REV.
 - 3) Indicating Lights: Red FOR, Red REV, Green OFF.
 - d. Two-Speed Starters:
 - 1) Pushbuttons: FAST-OFF-SLOW.
 - 2) Selector Switches: SLOW/OFF/FAST.
 - 3) Indicating Lights: Red FAST, Red SLOW, Green OFF.
- K. General Purpose Contactors: Combination type unless otherwise indicated.
1. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactor(s) and externally operable disconnect, but without integral overload relay(s).
 2. Noncombination Contactors: NEMA ICS 2, Class A noncombination motor controllers with magnetic contactor(s), but without integral overload relay(s).
 3. Configuration: Full-voltage non-reversing unless otherwise indicated.
 4. Minimum Contactor Size: NEMA Size 0.
 5. Use of non-standard contactor sizes smaller than specified standard NEMA sizes is not permitted.
 6. Disconnects: Circuit breaker or disconnect switch type as indicated.
 - a. Circuit Breakers: Thermal magnetic unless otherwise indicated or required.
 - b. Disconnect Switches: Fusible type unless otherwise indicated.

- c. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
 - d. Provide auxiliary interlock for disconnection of external control power sources where applicable.
 - 7. Pilot Devices Required:
 - a. Furnish local pilot devices for each unit as specified below unless otherwise indicated on drawings.
 - b. Contactors for motor applications where overload protection is provided separately or where motor contains integral thermal protectors to be provided with pilot devices as specified for magnetic motor starters above.
- L. Manual Motor Starters:
 - 1. Description: NEMA ICS 2, Class A manually-operated motor controllers with overload relay(s).
 - 2. Configuration: Non-reversing unless otherwise indicated.
 - 3. Fractional-Horsepower Manual Motor Starters:
 - a. Furnish with toggle operator.
 - b. Overload Relays: Bimetallic or melting alloy thermal type.
 - c. Provide means for locking operator in the OFF position.
 - d. Furnish Red ON indicating light where not within sight of equipment.
 - 4. Integral-Horsepower Manual Motor Starters:
 - a. Furnish with toggle or pushbutton operator.
 - b. Overload Relays: Bimetallic or melting alloy thermal type.
 - c. Provide means for locking operator in the OFF position.
 - d. Furnish Red ON indicating light where not within sight of equipment.
 - e. Provide auxiliary contact where indicated; normally open (NO) or normally closed (NC) as indicated or as required.
- M. Motor-Starting Switches: Horsepower-rated switches without overload protection; toggle operator.

2.3 OVERCURRENT PROTECTIVE DEVICES

- A. Overload Relays:
 - 1. Provide overload relays and, where applicable, associated current elements/heaters, selected according to actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
 - 2. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
 - 3. Trip-free operation.
 - 4. Visible trip indication.
 - 5. Resettable.
 - a. Employ manual reset unless otherwise indicated.
 - b. Employ automatic reset or remote reset where indicated.
 - c. Do not employ automatic reset with two-wire control.
 - 6. Bimetallic Thermal Overload Relays:
 - a. Provide ambient temperature compensation.
 - b. Interchangeable current elements/heaters.
 - c. Adjustable trip; plus/minus 10 percent of nominal, minimum.
 - d. Designed for quicker trip response under phase loss condition.
 - e. Trip test function.
 - f. Provide isolated alarm contact where indicated.
 - 7. Melting Alloy Thermal Overload Relays:
 - a. Interchangeable current elements/heaters.
 - b. Provide isolated alarm contact where indicated.
 - 8. Solid-State Overload Relays:
 - a. Selectable inverse-time trip class rating; available ratings of Class 10, 20, and 30, minimum.
 - b. Adjustable full load current.
 - c. Phase loss protection.
 - d. Phase imbalance protection.

- e. Ground fault protection.
 - f. Ambient temperature insensitive.
 - g. Thermal memory.
 - h. Repeat Trip Accuracy: Plus/minus 2 percent, minimum.
 - i. Trip test function.
 - j. Provide isolated alarm contact.
 - k. Provide communication capability where indicated: Compatible with system indicated.
 - l. Other Acceptable Product(s):
- B. Fusible Disconnect Switches:
- 1. Description: Quick-make, quick-break, dead-front fusible switch units complying with NEMA KS 1, and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.
 - 2. Fuse Clips: As required to accept indicated fuses.
 - a. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
 - 3. Provide externally operable handle with means for locking in the OFF position. Provide means for locking switch cover in the closed position. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- C. Circuit Breakers:
- 1. Interrupting Capacity (not applicable to motor circuit protectors):
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 - c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
 - 2. Motor Circuit Protectors:
 - a. Description: Instantaneous-trip circuit breakers furnished with magnetic instantaneous tripping elements for short circuit protection, but not with thermal inverse time tripping elements for overload protection; UL 489 recognized only for use as part of a listed combination motor controller with overload protection; ratings, configurations, and features as indicated on the drawings.
 - b. Provide field-adjustable magnetic instantaneous trip setting.
 - c. Provide the following features and accessories where indicated or where required to complete installation:
 - 1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
 - 2) Pad-Lock Provision: For locking circuit breaker handle in OFF position.
 - 3) Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
 - 4) Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
 - 5) Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.
 - 3. Molded Case Circuit Breakers:
 - a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489; ratings, configurations, and features as indicated on the drawings.
 - 1) Provide thermal magnetic circuit breakers unless otherwise indicated.
 - 2) Provide electronic trip circuit breakers where indicated.
 - b. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - 1) Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
 - 2) Provide interchangeable trip units where indicated.
 - c. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
 - 1) Provide the following field-adjustable trip response settings:
 - (a) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
 - (b) Long time delay.

- (c) Short time pickup and delay.
- (d) Instantaneous pickup.
- (e) Ground fault pickup and delay where ground fault protection is indicated.
- d. Provide the following features and accessories where indicated or where required to complete installation:
 - 1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
 - 2) Pad-Lock Provision: For locking circuit breaker handle in OFF position.
 - 3) Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
 - 4) Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
 - 5) Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

2.4 CONTROL ACCESSORIES

- A. Auxiliary Contacts:
 - 1. Comply with NEMA ICS 5.
 - 2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each magnetic motor starter, minimum.
- B. Pilot Devices:
 - 1. Comply with NEMA ICS 5; heavy-duty type.
 - 2. Nominal Size: 30 mm.
 - 3. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.
 - 4. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
 - 5. Indicating Lights: Push-to-test type unless otherwise indicated.
 - 6. Provide LED lamp source for indicating lights and illuminated devices.
- C. Control and Timing Relays:
 - 1. Comply with NEMA ICS 5.
 - 2. Provide number and type of relays indicated or required to perform necessary functions.
 - 3. Timing Relays: Electronic or pneumatic as indicated.
 - a. Adjustable Timing Range: As indicated on drawings.
 - 4. Multi-Speed Motor Starters: Employ accelerating relays, decelerating relays, and compelling relays where indicated.
 - 5. Accelerating Relays: Starts motor at low speed and then accelerates automatically through definite time intervals for each successive speed until selected speed is attained.
 - 6. Decelerating Relays: Allows motor to decelerate automatically through definite time intervals for each successive speed until selected speed is attained.
 - 7. Compelling Relays: Requires motor to start at low speed before a higher speed can be selected.
- D. Control Power Transformers:
 - 1. Size to accommodate burden of contactor coil(s) and all connected auxiliary devices, plus _____ VA spare capacity.
 - 2. Include primary and secondary fuses.
- E. Control Terminal Blocks: Include 25 percent spare terminals.

2.5 VARIABLE FREQUENCY DRIVES

- A. Provide Variable Frequency Motor Drives for equipment as indicated on the Drawings. Drives shall be enclosed in a NEMA 1 enclosure unless noted otherwise. The equipment shall have a SCCRE of 65,000 amps.
- B. All VFDs shall have the following standard features.

1. The same customer interface, including digital display, and keypad, shall be provided regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs.
 2. The keypad shall include Hand-Off-Auto selections and manual speed control. There shall be fault reset and “Help” buttons on the keypad. The Help button shall include “on-line” assistance for programming and troubleshooting.
 3. VFDs through 200 HP shall have internal chokes (reactors) providing 5% impedance.
 4. The input current rating of the VFD shall not be greater than the output current rating.
 5. The VFD shall provide a programmable loss-of-load (broken belt / broken coupling) Form-C relay output. The drive shall be programmable to signal the loss-of-load condition via a keypad warning, Form-C relay output, and / or over the serial communications bus.
- C. All VFDs to have the following adjustments:
1. Motor overload protection shall be provided in both drive and bypass modes.
 2. Run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, input contact closure, time-clock control, or serial communications), the VFD shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. (The closed end-switch is wired to a VFD digital input and allows VFD motor operation.)
 3. Programmable time delay for VFD start and a keypad indication that this time delay is active. A Form C relay output provides a contact closure to signal the VAV boxes open. (This will allow VAV boxes to be driven open before the motor operates)
 4. Fireman’s override input. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands), except customer defined safety run interlocks, and force the motor to run at a preset speed or in a separate PID mode.
- D. Serial Communications
1. The VFD shall have an EIA-485 port as standard. The standard protocols shall be Modbus, Johnson Controls N2, Siemens Building Technologies FLN, and BACnet. The use of third party gateways and multiplexers is not acceptable. All protocols shall be “certified” by the governing authority (i.e. BTL Listing for BACnet).
- E. All VFD’s shall include EMI/RFI filters. (The onboard filters shall allow the VFD assembly to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted level (Category C2)
- F. Bypasses shall be furnished and mounted by the drive manufacturer as indicated on the Drawings. All VFD with bypass configurations shall be UL Listed
1. A complete factory wired and tested bypass system consisting of a door interlocked, padlockable circuit breaker, output contactor, bypass contactor, and fast acting VFD input fuses
 2. The bypass shall maintain positive contactor control through the voltage tolerance window of nominal voltage +30%, -35%. Designs that will not allow input single phase operation in the VFD mode are not acceptable. (This feature is designed to avoid contactor coil failure during brown out / low line conditions and allow for input single phase operation when in the VFD mode.)
 3. Motor protection from single phase power conditions - the bypass system must be able to detect a single-phase input power condition while running in bypass, disengage the motor in a controlled fashion, and give a single-phase input power indication.
 4. The bypass system shall be designed for stand-alone operation and shall be completely functional in both Hand and Automatic modes even if the VFD has been removed from the system for repair / replacement. Serial communications shall remain functional even with the VFD removed.
 5. Serial communications – the bypass shall be capable of being monitored and / or controlled via serial communications. On-board communications protocols shall include ModBus RTU; Johnson Controls N2; Siemens Building Technologies FLN (P1); and BACnet MS/TP.
 6. The user shall be able to select the text to be displayed on the keypad when an external safety opens. Example text display indications include “FireStat”, “FreezStat”, “Over pressure” and “Low suction”. The user shall also be able to determine which of the four (4) safety contacts is open over the serial communications connection.

- G. Environmental operating conditions: -15 to 40 degrees C (5 to 104 degrees F) continuous. Altitude 0 to 3300 feet above sea level, less than 95%, non-condensing All circuit boards shall be coated to protect against corrosion.
- H. Acceptable manufacturers:
 - 1. Toshiba
 - 2. Hitachi
 - 3. Square D
 - 4. ABB

2.6 SOFT START STARTERS

- A. Operating Characteristics:
 - 1. Torque Control System
 - 2. Voltage Ramp
 - 3. Current Ramp
 - 4. Current % Limit: 200-500%
 - 5. Torque % Limit: 10-100%
 - 6. Acceleration Ramp time: 1-60 sec.
 - 7. Deceleration Ramp time: 0.5-60 sec.
 - 8. Free wheel stop
- B. Provide with fusible switch disconnect in common enclosure.
 - 1. Phase Failure Protection: Protection shall include phase loss (single phasing), low voltage (any or all phases), and phase sequence reversal.
- C. Control
 - 1. HAND-OFF-AUTO selector switch, spring return to "OFF" from "HAND" position.
 - 2. Provide for three wire (START-STOP) control from remote pushbuttons.
 - 3. Indicator Lights: Red Green pilot light on cover, illuminated while motor is running.
- D. Acceptable Manufacturers:
 - 1. Square D Altistart 58
 - 2. Or acceptable substitute from Allen Bradley or Cutler Hammer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that ratings of enclosed controllers are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed controllers.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install controllers in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and the NEC.
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Provide required seismic controls in accordance with Section 26 05 48.
- F. Install enclosed controllers plumb and level.
- G. Provide grounding and bonding in accordance with Section 26 05 26.
- H. Install all field-installed devices, components, and accessories.

- I. Provide fuses complying with Section 26 28 13 for fusible switches as indicated.
- J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- K. Set field-adjustable controllers and associated components according to installed motor requirements, in accordance with manufacturer's recommendations and NFPA 70.
- L. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 26 05 73.
- M. Identify enclosed controllers in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's reports with submittals.
- C. Correct deficiencies and replace damaged or defective enclosed controllers or associated components.
- D. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.4 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

- A. Clean dirt and debris from controller enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

3.6 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of controllers to Owner, and correct deficiencies or make adjustments as directed.
- D. Training: Train Owner's personnel on operation, adjustment, and maintenance of enclosed controllers and associated devices.

3.7 PROTECTION

- A. Protect installed enclosed controllers from subsequent construction operations.

END OF SECTION

SECTION 26 51 00 - LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Exterior luminaires.
- B. Ballasts and drivers.
- C. Lamps.
- D. Poles and accessories.
- E. Accessories.

1.2 RELATED REQUIREMENTS

- A. Section 26 01 00 - General Provisions
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 33 - Boxes for Electrical Systems.
- E. Section 26 05 53 - Identification for Electrical Systems.
- F. Section 26 09 19 - Enclosed Contactors.
- G. Section 26 09 23 - Lighting Control Devices.
- H. Section 26 27 26 - Wiring Devices.
- I. Section 26 28 13 - Fuses.

1.3 UNIT PRICES

- A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.
- B. Exterior Lighting Unit:
 - 1. Basis of Measurement: Each.
 - 2. Basis of Payment: Includes concrete foundation, pole, and luminaire(s) with lamps and accessories.

1.4 REFERENCE STANDARDS

- A. 47 CFR 15 - Radio Frequency Devices.
- B. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code).
- C. IEEE C2 - National Electrical Safety Code.
- D. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits.
- E. IES LM-63 - IESNA Standard File Format for Electronic Transfer of Photometric Data and Related Information.
- F. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products.
- G. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules.
- H. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- I. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems.

- J. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts.
- K. NFPA 70 - National Electrical Code (NEC).
- L. NFPA 101 - Life Safety Code.
- M. UL 844 - Luminaires for Use in Hazardous (Classified) Locations.
- N. UL 924 - Emergency Lighting and Power Equipment.
- O. UL 1598 - Luminaires.
- P. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
 - 2. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
 - 3. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.6 SUBMITTALS

- A. Submit material list in accordance with Section 26 00 01, describing all material furnished under Part 2 of this Section of the Specifications.
- B. Shop Drawings:
 - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 - 2. Provide photometric calculations where luminaires are proposed for substitution upon request.
 - 3. Provide structural calculations for each pole proposed for substitution.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 - b. Include IES LM-79 test report upon request.
 - 2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
 - 3. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.
- D. Sustainable Design Documentation: Submit manufacturer's product data on lamp mercury content and rated lamp life, showing compliance with specified requirements.
- E. Samples:
 - 1. Provide one sample(s) of each luminaire proposed for substitution upon request.
 - 2. Provide one sample(s) of each product finish illustrating color and texture upon request.
- F. Certificates for Dimming Drivers: Manufacturer's documentation of compatibility with dimming controls to be installed.
- G. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.

- H. Field quality control reports.
 - 1. Include test report indicating measured illumination levels.
- I. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation, and starting of product.
- J. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- K. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
 - 3. Extra Fuses: Five percent of total quantity installed for each type, but not less than two of each type.
 - 4. Touch-Up Paint: Two (2) gallons (8 liters), to match color of pole finish.
- L. Project Record Documents:
 - 1. Record actual connections and locations of luminaires and any associated remote components.
 - 2. Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.7 QUALITY ASSURANCE

- A. Comply with requirements of the NEC.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.8 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 501 (exterior lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.9 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide three (3) year manufacturer warranty for LED luminaires, including drivers.

PART 2 - PRODUCTS

2.1 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.
- B. Substitutions: Approved substitutes.

2.2 LUMINAIRES

- A. Manufacturers:
 - 1. As shown on the luminaire schedule on the drawings.
 - 2. Substitutions: Approved substitute.
- B. Provide products that comply with requirements of the NEC.

- C. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Provide products complying with Federal Energy Management Program (FEMP) requirements.
- F. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, drivers, reflectors, lenses, housings, and other components required to position, energize, and protect the lamp and distribute the light.
- G. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- H. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- I. Hazardous (Classified) Location Luminaires: Listed and labeled as complying with UL 844 for the classification of the installed location.
- J. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- K. Exposed Exterior Hardware: Stainless steel.

2.3 BALLASTS AND DRIVERS

- A. Manufacturers:
 - 1. As shown on the luminaire schedule on the drawings
 - 2. Substitutions: Approved substitute.
 - 3. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
 - 4. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.
- B. Drivers - General Requirements:
 - 1. Minimum Efficiency/Efficacy: Provide drivers complying with all current applicable federal and state efficiency/efficacy standards.
 - 2. Electronic Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.
- C. Dimmable LED Drivers:
 - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
 - 2. Control Compatibility: Fully compatible with the dimming controls to be installed.
 - a. Wall Dimmers: See Section 26 27 26.
 - b. Daylighting Controls: See Section 26 09 23.
 - 3. Product(s):
 - a. As shown on the luminaire schedule on the drawings

2.4 POLES

- A. Manufacturers:
 - 1. As shown on the luminaire schedule on the drawings.
 - 2. Substitutions: Approved substitute.
- B. All Poles:
 - 1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
 - 2. Structural Design Criteria:

- a. Comply with AASHTO LTS.
 3. Material: Steel, unless otherwise indicated.
 4. Shape: Square straight, unless otherwise indicated.
 5. Finish: Match luminaire finish, unless otherwise indicated.
 6. Mounting Height: As shown on the luminaire schedule on the drawings.
 7. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
 8. Unless otherwise indicated, provide with the following features/accessories:
 - a. Top cap.
 - b. Handhole.
 - c. Anchor bolts with leveling nuts or leveling shims.
 - d. Anchor base cover.
 - e. Provision for pole-mounted weatherproof GFI receptacle where indicated.
 - f. Brackets.
 - g. Hinged base.
 - h. Pole-top tenon.
- C. Metal Poles: Provide ground lug, accessible from handhole or transformer base.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with the NEC.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 05 33 as required for installation of luminaires provided under this section.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 501 (exterior lighting).
- E. Provide required support and attachment in accordance with Section 26 05 29.
- F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- G. Pole-Mounted Luminaires:
 1. Maintain the following minimum clearances:
 - a. Comply with IEEE C2.
 - b. Comply with utility company requirements.
 2. Foundation-Mounted Poles:
 - a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 30 00.
 - 1) Install anchor bolts plumb per template furnished by pole manufacturer.
 - 2) Position conduits to enter pole shaft.

- b. Install foundations plumb.
 - c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
 - d. Tighten anchor bolt nuts to manufacturer's recommended torque.
 - e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
 - f. Install anchor base covers or anchor bolt covers as indicated.
3. Embedded Poles: Install poles plumb as indicated.
 4. Grounding:
 - a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
 - b. Provide supplementary ground rod electrode as specified in Section 26 05 26 at each pole bonded to grounding system as indicated.
 5. Install separate service conductors, #12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
 6. Install non-breakaway in-line fuse holders and fuses complying with Section 26 28 13 in pole handhole or transformer base for each ungrounded conductor.
 7. Install weather resistant GFI duplex receptacle with weatherproof cover as specified in Section 26 27 26 in designated poles.
- H. Install accessories furnished with each luminaire.
- I. Bond products and metal accessories to branch circuit equipment grounding conductor.
- J. Install lamps in each luminaire.
- K. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.
- E. Measure exterior illumination levels at night with calibrated meters to verify compliance with performance requirements. Record test results in written report to be included with submittals.

3.5 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect.

3.6 CLEANING

- A. Clean surfaces according to NECA 501 (exterior lighting) and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

- C. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.
- D. Just prior to Substantial Completion, replace all lamps that have failed.

3.8 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

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SECTION 31 01 21 - APPLICATION OF WATER

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment, and performances of all work and services necessary or incidental to the application of water as indicated on the drawings or as specified herein.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items will be paid according to the referenced specification or as modified below:
 - 1. Measurement and compensation for water application required shall be included in the LUMP SUM price bid for the project or bidding section.

1.3 SPECIFICATION REFERENCES

- A. MnDOT 2130 will apply to this Section.
- B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.4 SUBMITTALS

- A. No submittals for this section.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. No exception to this section is made.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. The Contractor may contact the Owner to determine whether water is available from the Owner and the associated cost.
- B. The Contractor will apply water as required to obtain proper compaction, for all dust control and embankment construction.
- C. The Contractor shall NOT apply water in quantity or rate sufficient to cause erosion.

END OF SECTION

SECTION 31 11 00 - CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment, and performances of all work and services necessary or incidental to clearing and grubbing trees, stumps, and brush as indicated on the drawings or as specified herein.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items will be paid according to the referenced specification or as modified below:
 - 1. Measurement and compensation for clearing & grubbing shall be included in the LUMP SUM price bid for the project or bidding section.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances will not be individually paid. The costs will be included in the LUMP SUM price bid. Such items of work include but are not limited to:
 - 1. Permits and fees for the disposal of materials.
 - 2. Protecting existing improvements from damage.
 - 3. Protecting existing trees & root systems as designated on the landscape plans.

1.3 SPECIFICATION REFERENCES

- A. MnDOT 2101 will apply to this Section.
- B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.4 SUBMITTALS

- A. No submittals for this section.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. No exception to this section is made.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. Before clearing & grubbing or tree trimming to remove overhanging branches, the Contractor shall inspect the branches to be trimmed for occupied bird nests and/or hollows that may be used by birds or bats. If present, the Contractor shall document with photos to the best of their ability and contact the Architect before initiating clearing & grubbing or tree trimming. The Contractor shall not proceed until authorized in writing by the Architect
- B. All trees, stumps, brush, seed, grass, roots, or other undesirable material within the construction limits will be disposed of by the Contractor.
- C. Disposal methods will be approved by the Architect and shall meet all Local, State, and Federal regulations.
- D. Burning or burial will not be allowed within city limits.

END OF SECTION

SECTION 31 20 00 – EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the excavation and embankment of the site improvements as indicated on the drawings or as specified herein.

1.2 DEFINITIONS

- A. Compacted Volume (CV) – The volume of material actually placed as determined by computing the difference between original and final cross-sections by the average end area method.
- B. Excavated Volume (EV) – The volume of material actually excavated as determined by computing the difference between original and final cross-sections by the average end area method.
- C. Excess Material - Material that is not needed to complete the earthwork balance.
- D. Structural Improvements - For the purposes of this specification, structural improvements shall refer to any roadway, sidewalk, trail, building, sign, or other improvements requiring suitable soil to support the anticipated loadings.
- E. Subcut - Excavation performed below the proposed subgrade or building pad hold-down elevation shown on the plans for the purpose of removing unsuitable material.
- F. Subgrade - The top surface of a roadbed upon which the pavement structure (including aggregate base and/or granular subbase) is to be constructed. This is also a general term denoting the soil foundation upon which a proposed improvement is to be placed.
- G. Suitable Material - Sand, silty sand or low plasticity clay soils with no organic content. The Architect shall make the final determination as to what material will be considered suitable.
- H. Topsoil - Any soil, generally black in color, containing organic material.
- I. Unsuitable Material - Soil with organic content including topsoil, swamp deposits, peat, muck, or other material deemed by the Architect to be unsuitable for fill or embankment construction.

1.3 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. Measurement and compensation for earth moving shall be included in the LUMP SUM price bid for the project or bidding section.
 - (a) The Contractor shall make its own determination as to the earthwork balance on the site and shall include removal of any excess material or hauling in of any borrow material in its bid. No additional compensation shall be made for removal of excess material or the hauling in of borrow material.
 - 2. Measurement and payment for salvaging & reinstalling topsoil, or importing topsoil borrow shall be included in the LUMP SUM price bid for the project or bidding section
 - (a) The Contractor shall make its own determination as to the topsoil balance on the site and shall include removal of any excess topsoil or hauling in of any borrow topsoil in its bid. No additional compensation shall be made for removal of excess topsoil or the hauling in of borrow topsoil.
 - 3. Measurement and compensation for subgrade excavation and stabilizing aggregate shall be included in the LUMP SUM price bid for the project or bidding section.
 - (a) Excavation of unsuitable material below the assumed topsoil stripping depth and subsequent placement and compaction of suitable material or stabilizing aggregate shall be included in the LUMP SUM price bid for the project or bidding section.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances will not be individually paid. The costs will be included in the LUMP SUM price bid. Such items of work include but are not limited to:
 - 1. Separating, salvaging, stockpiling, and spreading of topsoil.

2. Subcutting the existing topsoil prior to placing embankment in all areas with proposed structural improvements.
3. Salvaging and separately stockpiling suitable aggregate base material, as determined by the Architect.
4. Separating, salvaging, stockpiling and placing suitable material for use in embankment areas.
5. Obtaining suitable material from areas with no proposed structural improvements to provide enough suitable material for embankments being constructed under proposed structural improvements.
6. Over-excavation in cut areas to provide room for placement of topsoil.
7. Earthwork balancing including adjustments for shrinkage loss.
8. Protecting existing improvements and previously accepted in-process improvements from damage.
9. Gradation and compaction testing, and geotechnical inspection services to meet requirements of Source and Field Quality Control, if required.
10. Farming, disking and/or drying suitable wet materials.
11. Excavation required for construction of any retaining wall.
12. The cost of all labor, equipment and materials necessary for meeting the testing requirements of source quality control, if required.
13. The cost of all labor, equipment and materials necessary for density testing, if required, as specified.
14. The cost of all labor, equipment and materials necessary for the disposal of excavated materials unsuitable for use in the construction.

1.4 SPECIFICATION REFERENCES

- A. MnDOT 2106 shall apply to the excavation and embankment for the site improvements, except as modified herein.
- B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.5 SUBMITTALS

- A. No submittals for this section.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All unsuitable excess excavated material shall become the property of the Contractor and shall be removed from the site and disposed of at a site secured by the Contractor.
- B. Stabilizing aggregates for use in backfilling subgrade excavations in roadway pavement areas shall be material generally produced and referred to as "1½-inch dust free aggregate", or other coarse aggregate found to be in general compliance by the Architect. Aggregate Base, Class 5 may also be used at the direction of the Architect.
- C. Frozen material will not be allowed for roadway or embankment construction. The Architect shall approve locations for placement of frozen material.

PART 3 - EXECUTION

3.1 GENERAL

- A. Excavated topsoil and suitable material for reuse in the project shall be segregated and stockpiled at a site selected by the Contractor.
- B. All excavations shall be kept free of water during the placement of fill.
- C. The Contractor shall utilize methods and equipment for excavating that will minimize the disturbance to the subgrade. The use of backhoes rather than scrapers or front-end loaders may be required to minimize repeated passes of equipment over wet subgrade soils.

- D. Sufficient common excavation shall be utilized by the Contractor to replace the soil shrinkage from excavation which occurs through the course of construction handling and compaction. The Contractor shall make its own estimate of the amount of shrinkage that will occur.
- E. Material suitable for curb backfill shall be segregated and stockpiled at a site selected by the Contractor. Following curb construction, the material shall be placed behind the curb, allowing for a minimum of 6.0-inches of topsoil.
- F. In areas where filling above the existing grade is necessary to establish the final designed elevation, the Contractor shall fully remove the topsoil and organic material to the level of stable underlying sand or clay prior to backfilling with suitable embankment material.
- G. The Contractor shall make its own determination as to whether the proposed grading has been completed according to the plans. When the Contractor determines that the grading has been completed, he will notify the Architect. Neither the Owner nor the Architect will provide any intermediate acceptance of the grading improvements until all the grading has been completed and all topsoil has been spread.

3.2 EXCAVATION AND EMBANKMENT IN AREAS WITH PROPOSED STRUCTURAL IMPROVEMENTS.

- A. All vegetation, topsoil, organic, or other unsuitable materials shall be excavated from the area below the structural improvement. Due to the variability of soils, the depth of the excavation in these areas is expected to vary significantly throughout the site.
- B. Subcut excavations shall be laterally oversized a distance of 1.0-foot beyond the edges of the proposed structural improvement for each foot of excavation depth (1:1 oversizing). The extents of the structural improvement areas shown on the plans do not necessarily show this 1:1 oversizing.
- C. Fill placed from the bottom of the subcut to the subgrade elevation shall be selected material from the excavation or borrow material. Such material shall consist of suitable material as defined above. Clay fill shall be moisture-conditioned to within 2 percent above or below the optimum moisture content determined from the Standard Proctor compaction test.
- D. The embankment material shall be spread in 6.0 to 8.0-inch loose lifts.
- E. In all roadway and pavement areas, the Contractor shall perform a roll test on the subgrade prior to placing any portion of the pavement structure. The roll test shall be performed with a fully loaded tandem truck. Soils which rut or deflect 1.0-inch or more shall be corrected by scarifying, drying, and recompacting the soils. Subgrade excavation shall only be performed as directed by the Architect.
- F. Subgrade excavation shall be performed only when the Architect and the Contractor both agree that the in-place soil cannot be made suitable by scarifying, drying, and recompacting. Such excavation shall be backfilled with suitable excess common excavation material, stabilizing aggregate, granular borrow or select granular borrow, as directed by the Architect. If the Contractor proceeds without approval from the Architect, all work and material to restore the roadbed to the proper grade shall be at the Contractor's expense.

3.3 EXCAVATION AND EMBANKMENT IN AREAS WITH NO PROPOSED STRUCTURAL IMPROVEMENTS

- A. Topsoil or unsuitable material may be used to construct embankments in areas with no structural improvements.

3.4 COMPACTION

- A. All embankment grading shall be compacted using the Quality Compaction Method.

3.5 SOURCE QUALITY CONTROL

- A. The Contractor shall arrange for having the following testing performed:
 - 1. One gradation test per each 500 tons or 275 cubic yards (CV) of select granular borrow.
 - 2. One gradation test per each 500 tons or 275 cubic yards (CV) of stabilizing aggregate.
- B. All testing shall be performed by an independent testing laboratory approved by the Architect.

3.6 FIELD QUALITY CONTROL

- A. Required Inspections:
 - 1. Areas with Proposed Structural Improvements:

- a. Inspection following the removal of unsuitable material and prior to placement of embankment material to ensure that all topsoil and unsuitable material has been removed, and that the exposed subgrade has sufficient bearing capacity for the anticipated structural improvement.
- B. The Contractor shall notify the Architect 24-hours prior to completing the removal of topsoil and unsuitable material in areas with proposed structural improvements to ensure that appropriate inspection may be performed.
- C. Samples for testing shall be taken from material at locations approved by the Architect. All sampling methods shall be approved by the Architect.
- D. The Contractor shall coordinate the site grading and inform the Architect when the roadway subgrade is ready for test rolling, prior to installing any aggregate base. The Architect may order some subgrade correction prior to allowing the installation of aggregate base.
- E. Should any of the specified tests or inspections fail, the Contractor may arrange and pay for additional tests or inspections as may be necessary to satisfy the Architect that the specified requirements have been met.

END OF SECTION

SECTION 31 23 13 - SUBGRADE PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment, and performance of all work and services necessary or incidental to roadway subgrade preparation as indicated on the drawings or as specified herein.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items will be paid according to the referenced specification or as modified:
 - 1. Measurement and compensation for subgrade preparation shall be included in the LUMP SUM price bid for the project or bidding section.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances will not be individually paid. The costs will be included in the LUMP SUM price bid. Such items of work include but are not limited to:
 - 1. Drying and adding water to the subgrade.
 - 2. Subgrade excavation, furnishing stabilizing aggregate, geotextile fabric installation, compaction, regrading, and/or other efforts necessary to repair the subgrade after satisfying the rolling test and failing to protect the subgrade.
 - 3. Test rolling the compacted subgrade.

1.3 SPECIFICATION REFERENCES

- A. MnDOT 2112 will apply to this Section.
- B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.4 SUBMITTALS

- A. No submittals for this section.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. No exception to the referenced specification is made.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. At the end of each day, and before the placement of aggregate base, the Contractor shall eliminate surface indentations, including those caused by sheeps foot rollers and tractor cleats, and roll the surface with a steel wheel or rubber-tired roller.
- B. The Contractor shall disc, scarify, shape and compact the street subgrade or existing base, adding water or drying as may be necessary to give uniform and desired density.
- C. If the subgrade is unstable and the instability is due to excessive moisture, the subgrade will be scarified and dried over a reasonable period. When the material has reached acceptable moisture limits, the material will be returned to the roadbed and compacted into place to the proper elevation. The roadbed will once again be test rolled. If the material continues to be unstable, the Architect may authorize the removal of the undesirable material as subgrade excavation.
- D. The subgrade will be compacted in accordance with the Quality Compaction Method.

3.2 FIELD QUALITY CONTROL

- A. The compacted subgrade will be test rolled using a fully loaded aggregate truck (tandem) in a pattern approved by the Architect. The subgrade stability will be considered adequate when the surface shows less than 1.0 inch of yielding or rutting after one pass, or as otherwise approved by the Architect.

END OF SECTION

SECTION 32 11 23 - AGGREGATE BASE COURSES

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to construct the aggregate base course as indicated on the drawings or as specified herein.

1.2 METHODS OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. Measurement and compensation for aggregate base courses shall be included in the LUMP SUM price bid for the project or bidding section.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances will not be individually paid. The costs will be included in the LUMP SUM price bid. Such items of work include but are not limited to:
 - 1. Protecting existing improvements and previously accepted in-process improvements from damage.
 - 2. Subgrade excavation, furnishing stabilizing aggregate, geotextile fabric installation, compaction, regrading, and/or other efforts necessary to repair the subgrade after satisfying the rolling test and failing to protect the integrity of the subgrade.
 - 3. The cost of all labor, equipment, and materials necessary for meeting the testing requirements of field quality control, if required, include in price bid for Aggregate Base.
 - 4. Furnishing and installing blue tops for gravel surface.
 - 5. Test rolling of the compacted aggregate base using a fully loaded aggregate truck (tandem).

1.3 SPECIFICATION REFERENCES

- A. MnDOT 2211 shall apply, except as modified herein.
- B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.4 SUBMITTALS

- A. One gradation test for each 500 tons or 275 cubic yards (CV) of each class of aggregate base.
- B. One percent crushing test.
- C. One aggregate quality test.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aggregate Base Class 5 shall be Class 5B, Class 5C, or 100 percent crushed limestone conforming to the Specifications for Aggregate Base Class 5 modified so that the percent passing the No. 200 sieve shall be 5 to 10 percent.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. At the end of each day the Contractor shall eliminate surface indentations, including those caused by sheeps foot rollers and tractor cletes, and roll the surface with a steel wheel or rubber-tired roller.
- B. The depth and class of aggregate base to be constructed shall be as shown on the plans. Aggregate base construction shall take place only after the street subgrade condition and grade has been examined by the Architect.
- C. All aggregate base courses shall be compacted using the Quality Compaction Method.
- D. The compacted aggregate base shall be test rolled using a fully loaded aggregate truck (tandem) in a pattern approved by the Architect. The stability of the compacted base shall be considered adequate when the surface shows less than one ¼-inch of

yielding or rutting after one pass, or as otherwise approved by the Architect. The test rolling of the compacted aggregate base using a fully loaded aggregate truck (tandem) shall be incidental.

3.2 SOURCE QUALITY CONTROL

- A. The Contractor shall arrange for having the following testing performed:
 - 1. One gradation test for each 500 tons or 275 cubic yards (CV) of each class of aggregate base.
 - 2. One percent crushing test.
 - 3. One aggregate quality test.
- B. Samples for testing shall be taken from material in place at the site at locations approved by the Architect. All sampling methods shall be approved by the Architect.
- C. The Contractor shall coordinate and perform tests in a timely manner and provide test results to the Architect prior to placement of bituminous or concrete surfaces.
- D. Should any of the specified tests fail, the Contractor may arrange and pay for additional tests as may be necessary to satisfy the Architect that the requirements have been met.
- E. All testing shall be performed by an independent testing laboratory approved by the Architect.

END OF SECTION

SECTION 321316 - DECORATIVE CONCRETE PAVING

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.

1.2 SUMMARY

- A. Section Includes:
 - 1. Decorative Concrete Paving with Top Cast finish.
- B. Related Requirements:
 - 1. Section 321623.13 "Concrete Walks" for concrete paving.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to decorative concrete paving, including but not limited to, the following:
 - a. Concrete mixture design.
 - b. Quality control of concrete materials and decorative concrete paving construction practices.
 - 2. Require representatives of each entity directly concerned with decorative concrete paving to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Decorative concrete paving installer.
 - e. Manufacturer's representative of decorative concrete paving system.

1.5 ACTION SUBMITTALS

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

- B. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color, pattern, or texture selection.
- C. Samples for Verification: For each type of exposed color, pattern, or texture indicated.
- D. Design Mixtures: For each decorative concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and testing agency.
- B. Material Certificates: For the following, from manufacturer:
 - 1. Cementitious materials.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Fiber reinforcement.
 - 4. Admixtures.
 - 5. Curing compounds.
 - 6. Applied finish materials.
 - 7. Bonding agent or epoxy adhesive.
 - 8. Joint fillers.
- C. Material Test Reports: For each of the following:
 - 1. Aggregates. Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
- D. Field quality-control reports.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer of decorative concrete paving systems.
- B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").
- C. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups of full-thickness sections of decorative concrete paving to demonstrate typical joints; surface color, pattern, and texture; curing; and standard of workmanship.
 - 2. Build mockups of decorative concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 96 inches by 96 inches.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on decorative concrete paving mixtures.

1.9 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.2 FORMS

- A. Form Materials: Section 321623.13 "Concrete Walks".

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, fabricated from as-drawn steel wire into flat sheets.
- B. Reinforcing Bars: ASTM A615/A615M, Grade 60; deformed.

- C. Steel Bar Mats: ASTM A184/A184M; with ASTM A615/A615M, Grade 60 deformed bars; assembled with clips.
- D. Plain-Steel Wire: ASTM A1064/A1064M, as drawn.
- E. Joint Dowel Bars: ASTM A615/A615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.
- F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.4 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
 - 1. Aggregates, Water, & Air-Entraining: Section 321623.13 "Concrete Walks".
- A. Air-Entraining Admixture: ASTM C260/C260M.
- B. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
- C. Water: Potable and complying with ASTM C94/C94M.

2.5 SURFACE RETARDER (P-01A) (P-01B) (P-02) (P-03)

- A. TOP-CAST water-based, top-surface retarder.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. GCP Applied Technologies – TOP-CAST Top-Surface Retarder
 - 1) Depth of Etch: up to 1/8"
 - 2) Grade - #03, #05, or #25 – Refer to Site Materials Schedule on Drawing L001.
 - b. Other approved equivalent.

2.6 CURING AND SEALING MATERIALS

- A. Curing Paper: Nonstaining, waterproof paper, consisting of two layers of kraft paper cemented together and reinforced with fiber, and complying with ASTM C 171.
- B. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
 - 1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. ChemMasters; Spray-Film.
 - b. Other approved equivalent.

- C. Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type I, Class B, manufactured for colored concrete.
 - 1. For integrally colored concrete, curing compound shall be pigmented type approved by coloring admixture manufacturer.
 - 2. For concrete indicated to be sealed, curing compound shall be compatible with sealer.
- D. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type I, Class A, manufactured for use with colored concrete.
- E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type I, Class A, manufactured for use with colored concrete.

2.7 RELATED MATERIALS

- A. Joint Fillers: ASTM D8139, semirigid, closed-cell polypropylene foam in preformed strips.
- B. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Polyethylene Film: ASTM D4397, 1 mil thick, clear.

2.8 CONCRETE MIXTURES

- A. Section 321623.13 "Concrete Walk".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below decorative concrete paving to identify soft pockets and areas of excess yielding.
 - 1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
 - 2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 - 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 312000 "Earth Moving."
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.
- B. Protect adjacent construction from discoloration and spillage during application of color hardeners, release agents, stains, curing compounds, and sealers.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 INSTALLATION OF STEEL REINFORCEMENT

- A. Section 32 16 23.13 "Concrete Walk"

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
 - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
 - 2. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 - 1. Locate expansion joints at intervals of 50 feet unless otherwise indicated.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
 - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 - 6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
 - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 - a. Tolerance: Ensure that sawed joints are within 3 inches in both directions from centers of dowels.
 - 2. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 3/8-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement dowels and joint devices.
- H. Screed paving surface with a straightedge and strike off.
- I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

3.8 SURFACE RETARDER FINISH (P-01A) (P-01B) (P-03)

- A. General: Confirm approved mock-ups, products, and final selections of TOP-CAST.
- B. Surface Preparation: Protect adjacent concrete and other paving surfaces while applying surface retarder.
- C. Installation: Place concrete and float or trowel finish. Consult the online Top-Cast User Guide prior to using the TopCast for additional concrete mix design and finishing technique considerations.

- D. Placement: Apply per manufacturer's recommendations. Apply TopCast uniformly to the wet concrete after the evaporation of the initial bleed water. Spray with a low-pressure sprayer (plastic preferred) until the surface has a complete hiding coat. Do not apply too sparingly. Use water for cleanup. Once dry (1–2 hours after application depending on ambient temperature and humidity), Top-Cast provides good protection against intermittent rain and does not require additional cover.
- E. Removal: Remove per manufacturer's recommendations. Remove the TopCast surface retarder with a garden hose and stiff broom or if removing Top-Cast later use high-pressure water and scrubbing.

3.9 SURFACE RETARDER FINISH (P-02)

- A. General: Confirm approved mock-ups, products, and final selections of TOP-CAST.
- B. Surface Preparation: Protect adjacent concrete and other paving surfaces while applying surface retarder.
- C. Installation: Place concrete and float or trowel finish. Consult the online Top-Cast User Guide prior to using the TopCast for additional concrete mix design and finishing technique considerations.
- D. Placement: Apply per manufacturer's recommendations. Apply TopCast uniformly to the wet concrete after the evaporation of the initial bleed water. Spray with a low-pressure sprayer (plastic preferred) until the surface has a complete hiding coat. Do not apply too sparingly. Use water for cleanup. Once dry (1–2 hours after application depending on ambient temperature and humidity), Top-Cast provides good protection against intermittent rain and does not require additional cover.
- E. Removal: Remove per manufacturer's recommendations. Remove the TopCast surface retarder with a garden hose and stiff broom or if removing Top-Cast later use high-pressure water and scrubbing.

3.10 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Compound: Apply immediately after final finishing. Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.
 - 1. Cure integrally colored concrete with a pigmented curing compound.
- F. Curing and Sealing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat the process 24 hours later and apply a second coat. Maintain continuity of coating, and repair damage during curing period.
- G. Curing Paper: Cure with unwrinkled curing paper in pieces large enough to cover the entire width and edges of slab. Do not lap sheets. Fold curing paper down over paving edges and secure with continuous banks of earth to prevent displacement or billowing due to wind. Immediately repair holes or tears in paper.

3.11 SEALER APPLICATION

- A. Clear Acrylic Sealer: Apply uniformly in two coats in continuous operations according to manufacturer's written instructions. Allow first coat to dry before applying second coat, at 90 degrees to the direction of the first coat, using same application methods and rates.

1. Begin sealing dry surface no sooner than 14 days after concrete placement.

3.12 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8-inch, minus 1/4 inch.
3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/2 inch.
4. Lateral Alignment and Spacing of Dowels: 1 inch.
5. Vertical Alignment of Dowels: 1/4 inch.
6. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
7. Joint Spacing: 3 inches.
8. Contraction Joint Depth: Plus 1/4 inch, no minus.
9. Joint Width: Plus 1/8 inch, no minus.

3.13 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C172/C172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 5000 sq. ft. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C31/C31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C39/C39M; test one specimen at seven days and two specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Decorative concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.

3.14 REPAIR AND PROTECTION

- A. Remove and replace decorative concrete paving that is broken or damaged or does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Detailing: Grind concrete "squeeze" left from tool placement. Color ground areas with slurry of color hardener mixed with water and bonding agent. Remove excess release agent with high-velocity blower.
- C. Protect decorative concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain decorative concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321316

SECTION 32 15 40 - STABILIZED AGGREGATE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: The work shall include the supply and installation of the following:
 - 1. Crushed Aggregate Paving Base Course
 - 2. Crushed Aggregate Paving Material
 - 3. Organic Binder

- B. Related Sections:
 - 1. Div. 31 Section Fill
 - 2. Div. 31 Sub-base preparation

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Organic Binder
 - 2. Aggregate gradation analysis report

- B. Samples:
 - 1. Base Course – 1 quart sample.
 - 2. Base Course gradation indicating that the product meets specifications.
 - 3. Crushed Aggregate Paving – 1 quart sample.
 - 4. Crushed Aggregate Paving gradation indicating that the product meets specifications.

1.3 COMPACTION TESTS

- A. Tests on compacted subgrade and finished crushed aggregate paving shall be performed to confirm that material has been compacted to densities indicated in the Contract Documents. Testing to be performed by independent agency. Cost for test to be included in project contract at no additional cost to project.

- B. Frequency of compaction tests;
 - 1. Subgrade; Every 100 square yards of compacted subgrade.
 - 2. Crushed aggregate paving; Every 100 square yards of compacted crushed aggregate paving (before watering).

1.4 MOCK UP

- A. Install 10 square feet minimum of stabilized crushed aggregate paving including base course. Mockup may become part of project if approved.

- B. Allow Landscape Architect and Owner's Representative to view mock-up for approval before proceeding with rest of stabilized crushed aggregate paving.

1.5 FIELD CONDITIONS

- A. Do not install stabilized crushed aggregate paving when subgrade is wet at saturated field capacity.

PART 2 - PRODUCTS

2.1 BASE COURSE MATERIAL

- A. Comply with MnDOT, Aggregate Material, #3138

2.2 CRUSHED AGGREGATE MATERIAL

- A. Organic-Lock Stabilized Aggregate.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Kafka Granite
 - b. Or approved equal.
 - 2. Products: Stabilized Patina Granite
 - a. Crushed Aggregate Material shall consist of sound, angular, durable particles.
 - b. Gradation, in accordance with ASTM C136:

Sieve	Sieve Size (mm)	Percent Passing
4	4.75	80-100%
8	2.36	65-90%
16	1.18	40-65%
30	0.6	25-55%
50	0.3	15-35%
100	0.15	10-20%
200	0.075	5-15%

2.3 ORGANIC BINDER

- A. Organic-Lock™ manufactured by Envirobond Products Corp, or approved equal. All references to “Binder” in this specification refer to this organic binder.

2.4 FACTORY BLENDING

- A. Mix Crushed Aggregate Material with Binder using a pug mill that includes a weigh-belt feeder.
- B. AZS Mix at a rate of 34 lbs. of Binder per 2000lbs. of aggregate.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine grading and subsoil conditions. Do not proceed until conditions are acceptable.

3.2 PREPARATION OF SUBGRADE

- A. Excavate to depth required so that finish grade can be established as noted on plans.
- B. Compact subgrade to 95% Modified Proctor Density.

3.3 BASE COURSE

- A. Place base course material over subgrade to depths and dimensions shown on drawings in maximum 150mm (6") lifts compacted to 95% Modified Proctor Density.

3.4 CRUSHED AGGREGATE PAVING

- A. Spread stabilized crushed aggregate paving, finish grade and compact to 95% Modified Proctor Density to depths and dimensions shown on the drawings. An asphalt spreader is ideal for spreading the product. In areas where the stabilized crushed aggregate paving is to exceed 75mm (3") in depth, the material must be installed in lifts. Each lift shall be fully compacted to 95% Modified Proctor Density. Use a 1-5 ton double or single static drum roller, or equivalent. Do not use a vibratory compactor or vibratory setting on the compactor.

Approximate Coverage Rates per metric ton:

Area (sq.ft)	Depth (in.)
100	2
75	3
50	4

- B. Apply water to the surface of the stabilized crushed aggregate to activate the Binder. Approximately 25 to 45 gallons of water per ton must be applied to saturate the material.
- C. Depending on weather conditions, the time required to allow the material to set-up and allow further compaction can vary. Generally, this time period is between 6 and 48 hours. The top layer should be firm and not sticky. Compaction can begin when you can walk on the material without significantly sinking in and material does not feel muddy. If material sticks to the roller during compaction, allow the material to further dry. Do not allow the material to completely dry out.
- D. Make 3-4 passes using a 1-5 ton double or single static drum roller, or equivalent. Do not use a vibratory compactor or vibratory setting on the compactor.
- E. After final compaction, the surface shall be true to elevation and shall not vary by more than 5mm (1/4") tested with a 3m straight edge at any location on the surfaces. Surfaces shall be crowned at a minimum of 2% and about flush with adjacent materials and/or edge restraint. The surface shall be sloped a minimum of 1% to drain away from structures.

3.5 ADJUST AND CLEAN

- A. All paved areas or adjacent surface shall be brushed clean and excess materials shall be removed from the work site and disposed of in an approved dump location.

3.6 PROTECTION

- A. Do not allow traffic on stabilized crushed aggregate paving for four days after placement or until compacted stabilized crushed aggregate paving has fully cured. This time may vary depending on weather conditions.

- B. Protect stabilized crushed aggregate paving surface from damage until project completion. Repair damaged areas to match specified requirements.

3.7 MAINTENANCE & REPAIRS

- A. Loose aggregate will appear on the surface over time and is a natural occurrence. If excess material becomes loose, redistribute the material over the surface, water thoroughly and re-compact with a minimum 1-ton drum roller.
- B. To repair, excavate damaged area and scarify exposed stabilized crushed aggregate paving. Pre-blend replacement crushed aggregate material with Binder at the specified rate. Apply material to the excavated area and compact. Thoroughly water the material and allow the material to cure, but not completely dry out. Re-compact the material, ensuring that the final grade and crown are maintained. Do not use a vibratory compactor.
- C. For large areas of loose surface material or surface damage, more extensive surface revitalization can be conducted. Fill any depressions with new crushed aggregate material, and remove any foreign material from the rest of the surface to be repaired. Use a drop spreader to apply Binder over the surface at a rate of 20-25lbs per 100sq. ft. of surface. Use a rotary tiller to till the Binder into the existing surface (3-4 passes) and then compact to 95% Modified Proctor Density. Thoroughly water the material and allow the material to cure, but not completely dry out. Re-compact the material, ensuring that the final grade and crown are maintained.

END OF SECTION 32 1540

SECTION 32 16 14 - CURBS, GUTTERS, AND DRIVEWAYS

PART 1 - GENERAL

1.1 SUMMARY

- A. This work consists of constructing cast-in-place concrete curbs, curb and gutter, medians, driveway pavement, pedestrian ramps, and other similar traffic delineation or service items as indicated on the drawings or as specified herein.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. Measurement and compensation for concrete curbs, gutters, and driveways shall be included in the LUMP SUM price bid for the project or bidding section.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances will not be individually paid. The costs will be included in the LUMP SUM price bid. Such items of work include but are not limited to:
 - 1. Aggregate base placed under pavements.
 - 2. Cold weather concrete protection methods and materials required.
 - 3. High early strength concrete.
 - 4. Provide adequate barricades and personnel to protect fresh concrete from pedestrian traffic and graffiti.
 - 5. Provide temporary walkways spanning fresh concrete where required to maintain access into building entrances.
 - 6. Casting and curing concrete compressive test cylinders and the performance of compressive strength tests as specified.
 - 7. Slump and air entrainment testing.

1.3 SPECIFICATION REFERENCES

- A. MnDOT 2301.
- B. MnDOT 2531.
- C. MnDOT 3137.
- D. MnDOT Standard Plates.
- E. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.4 SUBMITTALS

- A. A copy of the certified mix design shall be submitted to the Architect for review at least seven days prior to the placement of any concrete.
- B. For projects not funded using federal, state and/or state-aid funds, either a MnDOT approved mix design or a mix design prepared by an independent certified testing laboratory secured by the Contractor will be accepted.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Adjust class and composition of coarse aggregate material in the mixture to comply with 3.2.B.
- B. The coarse aggregate designation shall be ASTM #67* from MnDOT Table 3137.2-4.
- C. High early strength concrete shall be used for all driveway pavements.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. The use of dimensional lumber as forms is permitted if the dimension of the lumber is within ½-inch of the specified dimension of the finished concrete.
- B. The width of all driveways shall be established in the field by the project Architect or Owner.
- C. The joints in the driveway pavement shall match with the sidewalk and curb control joints. The Contractor shall be fully responsible for proper jointing patterns. Mismatched jointing will require removal and replacement of components to achieve the desired results. All removal and replacement of rejected construction shall be at the Contractor's expense.
- D. The tooling tolerances as outlined in MnDOT 2531 for surface uniformity, alignment and jointing shall be reviewed by the Contractor prior to the construction. Defects found during examinations will require the Contractor to remove and replace those areas. No deduction in unit price will be acceptable to satisfy defective areas found.
- E. Backfill along exposed edges of slabs and/or behind the curb with selected salvage material from the excavation to the elevation shown on the design detail plate.
- F. The Contractor shall imprint the concrete curb at the locations of the utility service locations if indicated and in accordance with the plans.

3.2 FIELD QUALITY CONTROL

- A. Testing
 - 1. The Contractor shall conduct various material tests throughout the construction to determine conformance with these specifications, including but not limited to:
 - a. Air and slump cone tests.
 - b. Beam and cylinder testing.
 - 2. The Contractor's shall cooperate with the individuals conducting the testing operations.
- B. Surface Requirements
 - 1. Immediately after placement and within the warranty period, no finished surface shall exceed the following defect rates. A surface defect is defined as any loss of aggregate or mortar from the surface that is larger than ¼-inch in diameter and greater than ¼-inch in depth. Any area not meeting the below thresholds shall be considered defective work and replaced at no expense to the Owner.
 - a. Defect Thresholds:
 - (1) Two (2) per 10 LF section of curb and gutter.
 - (2) Two (2) per 36 square feet of sidewalk or driveway apron.
 - 2. The following shall also be considered as defective work at any rate and replaced at no expense to the Owner:
 - a. Cracking outside of control joints.
 - b. Surface flaking / mortar flaking.
 - c. Surface spalling.
 - d. Surface imprints not conforming to specified texture and finish.
 - e. Chipping.
- C. Defective sections or panels shall be replaced to the nearest construction joint.

END OF SECTION

SECTION 32 16 23.13 – CONCRETE WALKS

PART 1 - GENERAL

1.1 SUMMARY

- A. This work consists of constructing concrete.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. Measurement and compensation for concrete walks and pedestrian ramps shall be included in the LUMP SUM price bid for the project or bidding section.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances will not be individually paid. The costs will be included in the LUMP SUM price bid. Such items of work include but are not limited to:
 - 1. Saw cutting all concrete joints.
 - 2. Cold weather concrete protection methods and materials required.
 - 3. Provide adequate barricades and personnel to protect fresh concrete from pedestrian traffic and graffiti.
 - 4. Provide temporary walkways spanning fresh concrete where required to maintain access into building entrances.
 - 5. Use of high early strength concrete.
 - 6. Furnishing & Installing truncated domes per MnDOT Standard Plate 7038 at locations shown on the plans.
 - 7. Furnishing & Installing epoxy coated reinforcement bar per MnDOT Standard Plan 5-297.250.

1.3 SPECIFICATIONS REFERENCES

- A. MnDOT 2521 shall apply to the construction of concrete walks, except as modified herein.
- B. MnDOT 3137 shall apply, except as modified herein.
- C. MnDOT Standard Plates.
- D. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.4 SUBMITTALS

- A. A copy of the certified mix design shall be submitted to the Architect for review at least seven days prior to the placement of any concrete.
- B. For projects not funded using federal, state and/or state-aid funds the mix design may be determined by an independent certified testing laboratory secured by the Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. CONCRETE
 - 1. Adjust class and composition of coarse aggregate material in the mixture to comply with 3.2.B.
 - 2. The coarse aggregate designation shall be ASTM #67* from MnDOT Table 3137.2-4.
- B. The foundation materials shall be in accordance with the plans.
- C. TRUNCATED DOME SYSTEMS FOR PEDESTRIAN CURB RAMPS.
 - 1. Truncated dome panels shall be manufactured by Neenah Foundry Co. or East Jordan Iron Works. Truncated dome panels shall not be colored.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. The use of dimensional lumber as forms is permitted if the dimension of the lumber is within ½-inch of the specified dimension of the finished concrete.

3.2 FIELD QUALITY CONTROL

A. Testing

- 1. The Contractor shall conduct various material tests throughout the construction to determine conformance with these specifications, including but not limited to:
 - a. Air and slump cone tests.
 - b. Beam and cylinder testing.
- 2. The Contractor's shall cooperate with the individuals conducting the testing operations.

B. Surface Requirements

- 1. Immediately after placement and within the warranty period, no finished surface shall exceed the following defect rates. A surface defect is defined as any loss of aggregate or mortar from the surface that is larger than ¼-inch in diameter and greater than ¼-inch in depth. Any area not meeting the below thresholds shall be considered defective work and replaced at no expense to the Owner.
 - (a) Defect Thresholds: Two (2) per 36 square feet of sidewalk or driveway apron.
- 2. The following shall also be considered as defective work at any rate and replaced at no expense to the Owner:
 - a. Cracking outside of control joints.
 - b. Surface flaking / mortar flaking.
 - c. Surface spalling.
 - d. Surface imprints not conforming to specified texture and finish.
 - e. Chipping.

- C. Defective sections or panels shall be replaced to the nearest construction joint.

END OF SECTION

SECTION 321816.13 - PLAYGROUND PROTECTIVE SURFACING

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.

1.2 SUMMARY

- A. Section Includes:
 - 1. Organic loose-fill surfacing.

1.3 DEFINITIONS

- A. Definitions in ASTM F2223 apply to Work of this Section.
- B. Critical Height: Standard measure of shock attenuation according to ASTM F2223; same as "critical fall height" in ASTM F1292. According to ASTM F1292, this approximates "the maximum fall height from which a life-threatening head injury would not be expected to occur."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of protective surfacing.
 - 1. Include plans, sections, and placement details.
 - 2. Include accessories and edge terminations.
 - 3. Include fall heights and use zones for equipment and structures specified in Section 116800 "Play Field Equipment and Structures," coordinated with the critical heights for protective surfacing.
- C. Samples for Verification: For each type of protective surfacing and exposed finish.
 - 1. Loose-Fill Surfacing: Minimum 1 quart.
 - 2. Drainage/Separation Geotextile: Minimum 12 by 12 inches.
 - 3. Drainage Panel: Minimum 6 by 6 inches.
 - 4. Weed-Control Barrier: Minimum 12 by 12 inches
- D. Product Schedule: For protective surfacing. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Material Certificates: For each type of loose-fill surfacing.
- C. Field quality-control reports.

- D. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For playground protective surfacing to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Loose Fill: Amount equal to 1 percent of amount installed, but no fewer than 3 units
 - 2. Edging Units: 3 full-size units.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.9 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace components of protective surfacing that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Reduction in impact attenuation as measured by reduction of critical fall height.
 - b. Deterioration of protective surfacing and other materials beyond normal weathering.
 - 2. Warranty Period: Minimum of Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain protective surfacing materials, including loose-fill accessories, from single source from single manufacturer.
 - 1. Provide geosynthetic accessories of each type from source recommended by manufacturer of protective surfacing materials.

2.2 PERFORMANCE REQUIREMENTS

- A. Impact Attenuation: Critical fall height tested according to ASTM F1292.
- B. Accessibility Standard: Minimum surfacing performance according to ASTM F1951.

2.3 ORGANIC LOOSE-FILL SURFACING (P-06)

- A. Engineered Wood Fiber: ASTM F2075; containing no bark, leaves, twigs, or foreign or toxic materials; tested for accessibility according to ASTM F1951.
1. Critical Height: As indicated on Drawings.
 2. Uncompressed Material Depth: Not less than as required for critical height indicated.

2.4 LOOSE-FILL ACCESSORIES

- A. Stabilizing Mats: Water-permeable PVC or rubber mats tested for impact attenuation according to ASTM F1292, with anchoring system designed to anchor mat securely to subgrade through loose fill, and rated for use in the following locations:
1. Under and in Front of Slide Exits: At finished grade of protective surfacing.
 2. Under and Around Swings: At finished grade of protective surfacing.
 3. At high-traffic areas and playground equipment where indicated on Drawings.
 4. Size: Manufacturer's standard size as recommended in writing.
 5. Color(s): As selected by Architect from manufacturer's full range.

2.5 GEOSYNTHETIC ACCESSORIES

- A. Drainage/Separation Geotextiles: Comply with Section 312000 "Earth Moving."
- B. Drainage/Separation Geotextile: Nonwoven, needle-punched geotextile, manufactured for drainage applications and made from polyolefins or polyesters; with the following minimum properties:
1. Weight: 4 oz./sq. yd.; ASTM D5261.
 2. Water Flow Rate: 100 gpm/sq. ft. according to ASTM D4491.
- C. Drainage Panel: Prefabricated, composite drainage panels made with drainage core and filter fabric.
1. Drainage Core: Three-dimensional, nonbiodegradable, molded-plastic-sheet material designed to effectively drain water under maximum fill pressures.
 2. Fabric: Nonwoven, needle-punched geotextile, specifically manufactured as a filter geotextile and made from polyolefins or polyesters; with the following minimum properties:
 - a. Weight: 4 oz./sq. yd. according to ASTM D5261.
 - b. Water Flow Rate: 150 gpm/sq. ft. according to ASTM D4491.
 3. Minimum Flow Rate: 9 gpm/foot according to ASTM D4491.
- D. Weed-Control Barrier: Composite fabric geotextile consisting of woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, weighing not less than 4.8 oz./sq. yd..

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for subgrade elevations, slope, and drainage and for other conditions affecting performance of the Work.

1. Verify that substrates are sound and without high spots, ridges, holes, and depressions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates to receive surfacing products according to protective surfacing manufacturer's written instructions.

3.3 INSTALLATION OF GEOSYNTHETIC ACCESSORIES

A. Install geosynthetic accessories before edging and according to playground surface system manufacturer's and geosynthetic manufacturer's written instructions and in a manner that cannot become a tripping hazard.

1. Drainage/Separation Geotextile: Completely cover area beneath protective surfacing, overlapping geotextile sides and edges a minimum of 8 inches with manufacturer's standard treatment for adhesively bonded or taped seams.
2. Drainage Panels: Completely cover area beneath protective surfacing, abutting the drainage cores and overlapping seams with geotextile fabric facing with manufacturer's standard treatment overlapping loosely laid seams.
3. Weed-Control Barrier: Completely cover area beneath loose-fill installation, overlapping barrier edges a minimum of 8 inches with manufacturer's standard treatment for overlapping loosely laid seams.

3.4 INSTALLATION OF LOOSE-FILL SURFACING

A. Apply components of loose-fill surfacing according to manufacturer's written instructions to produce a uniform surface.

B. Edging: Place and permanently secure edging in place, and attach units to each other.

C. Loose Fill: Place loose-fill materials to required depth after installation of playground equipment support posts and foundations. Include manufacturer's recommended amount of additional material to offset natural compaction over time.

D. Stabilizing Mats: Coordinate installation of mats and mat anchoring system with placing loose fill.

E. Grading: Uniformly grade loose fill to an even surface free from irregularities.

F. Finish Grading: Hand rake to a uniformly smooth finished surface and to required elevations.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests.

B. Perform the following tests with the assistance of a factory-authorized service representative:

1. Perform "Installed Surface Performance Test" according to ASTM F1292 for each protective surfacing type and thickness in each playground area.
2. Perform installed-surface-performance tests at no less than one series of tests for each 1000 sq. ft. of each type and thickness of in-place protective surfacing or part thereof.

- C. Playground protective surfacing will be considered defective if it does not pass tests.
- D. Prepare test reports.

END OF SECTION 321816.13

SECTION 323300 - SITE FURNISHINGS

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.

1.2 SUMMARY

- A. Section Includes:

1. Seating.
2. Tables.
3. Bicycle racks.
4. Trash receptacles.
5. Shade Pavilions
6. Drinking Fountain.

- B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing pipe sleeves cast installing anchor bolts cast formed voids in concrete footings.
2. Section 312000 "Earth Moving" for excavation for installing concrete footings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Samples for Initial Selection: For units with factory-applied finishes.
- D. Samples for Verification: For each type of exposed finish, not less than 6-inch-long linear components and 4-inch-square sheet components.
- E. Product Schedule: For site furnishings. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For site furnishings manufactured with preservative-treated wood.
 1. Indicate type of preservative used and net amount of preservative retained. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For site furnishings to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Bench Replacement Slats: No fewer than two full-size units for each size indicated.

PART 2 - PRODUCTS

2.1 SEATING (**SF-01, SF-02, SF-03, SF-07**)

- A. Per Reference Notes Schedule on Drawing L001 and Details on Drawing L501, L502.

2.2 TABLES (**SF-04**)

- A. Per Reference Notes Schedule on Drawing L001 and Details on Drawing L502.

2.3 BICYCLE RACKS (**SF-06**)

- A. Per Reference Notes Schedule on Drawing L001 and Details on Drawing L502.

2.4 TRASH RECEPTACLES (**SF-05**)

- A. Per Reference Notes Schedule on Drawing L001 and Details on Drawing L502.

2.5 DRINKING FOUNTAIN (**SF-09**)

- A. Per Reference Notes Schedule on Drawing L001 and Details on Drawing L501.

2.6 SHADE PAVILIONS (**AM-01, AM-02**)

- A. Per Reference Notes Schedule on Drawing L001 and Details on Drawing L503.

2.7 MATERIALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:
 - 1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B211.
 - 2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B221.
 - 3. Structural Pipe and Tube: ASTM B429/B429M.
 - 4. Sheet and Plate: ASTM B209.

-
5. Castings: ASTM B26/B26M.
- B. Steel and Iron: Free of surface blemishes and complying with the following:
1. Plates, Shapes, and Bars: ASTM A36/A36M.
 2. Steel Pipe: Standard-weight steel pipe complying with ASTM A53/A53M, or electric-resistance-welded pipe complying with ASTM A135/A135M.
 3. Tubing: Cold-formed steel tubing complying with ASTM A500/A500M.
 4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A513/A513M, or steel tubing fabricated from steel complying with ASTM A1011/A1011M and complying with dimensional tolerances in ASTM A500/A500M; zinc coated internally and externally.
 5. Sheet: Commercial steel sheet complying with ASTM A1011/A1011M.
 6. Perforated Metal: From steel sheet not less than 0.090-inch nominal thickness; manufacturer's standard perforation pattern.
 7. Expanded Metal: Carbon-steel sheets, deburred after expansion, and complying with ASTM F1267.
 8. Malleable-Iron Castings: ASTM A47/A47M, grade as recommended by fabricator for type of use intended.
 9. Gray-Iron Castings: ASTM A48/A48M, Class 200.
- C. Stainless Steel: Free of surface blemishes and complying with the following:
1. Sheet, Strip, Plate, and Flat Bars: ASTM A240/A240M or ASTM A666.
 2. Pipe: Schedule 40 steel pipe complying with ASTM A312/A312M.
 3. Tubing: ASTM A554.
- D. Wood: Surfaced smooth on four sides with eased edges; kiln dried, free of knots, solid stock of species indicated.
1. Wood Species: As listed on Reference Notes Schedule.
 2. Finish: Manufacturer's standard transparent wood-preservative treatment and sealer.
- E. Fiberglass: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and with manufacturer's standard finish.
- F. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.
1. Polyethylene: Fabricated from virgin plastic HDPE resin.
- G. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality, tamperproof, vandal and theft resistant, concealed, recessed, and capped or plugged.
1. Angle Anchors: For inconspicuously bolting legs of site furnishings to on-grade substrate; one per leg.
 2. Antitheft Hold-Down Brackets: For securing site furnishings to substrate; two per unit.
- H. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M; recommended in writing by manufacturer, for exterior applications.
- I. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.
- J. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:

1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil thick.
2. Hot-Dip Galvanizing: According to ASTM A123/A123M, ASTM A153/A153M, or ASTM A924/A924M.

2.8 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment: Pressure-treat wood according to AWPA U1, Use Category UC3b, and the following:
 1. Use preservative chemicals acceptable to authorities having jurisdiction and containing no arsenic or chromium. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 2. Kiln-dry lumber and plywood after treatment to a maximum moisture content, respectively, of 19 and 15 percent. Do not use materials that are warped or do not comply with requirements for untreated materials.

2.9 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended, so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces.
- E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- F. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.10 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.11 ALUMINUM FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.12 STEEL AND GALVANIZED-STEEL FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.
- B. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

2.13 IRON FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.14 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run directional finishes with long dimension of each piece.
 - 2. Directional Satin Finish: ASTM A480/A480M, No 4.
 - 3. Dull Satin Finish: ASTM A480/A480M, No. 6.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch larger than OD of post. Clean holes of loose material, insert

posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

- F. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

END OF SECTION 323300

SECTION 32 84 00 – PERFORMANCE SITE IRRIGATION

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.

1.2 SUMMARY

- A. Section Includes:

1. Piping.
2. Pipe Sleeving.
3. Manual valves.
4. Automatic control valves.
5. Automatic drain valves.
6. Connection to Water Supply
7. Sprinklers.
8. Quick couplers.
9. Drip irrigation specialties.
10. Controllers.
11. Boxes for automatic control valves.

- B. Related Sections:

1. Section 329113 "Soil Preparation" for planting bed and rain garden soil preparations.
2. Section 329200 "Turf and Grasses" for sodding/seeding (lawn).
3. Section 329300 "Plants" for planting.

1.3 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. ET Controllers: EvapoTranspiration Controllers. Irrigation controllers which use some method of weather-based adjustment of irrigation. These adjusting methods include use of historical monthly averages of ET; broadcasting of ET measurements; or use of on-site sensors to track ET.
- D. Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.
- E. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.4 SCOPE OF WORK

- A. Furnish all design, labor, materials, and equipment for the proper installation of an irrigation system to service all lawn and planting areas. Maintain 100 percent water coverage of planting areas indicated.
- B. ALL LANDSCAPE AREAS SHOWN ON THE LANDSCAPE PLAN IS TO BE IRRIGATED (UNLESS NOTED OTHERWISE). THIS INCLUDES THE PUBLIC RIGHT-OF-WAY BOULEVARD PLANTING BEDS AND STREET TREES.
 - 1. Native grass seeded areas are not to be irrigated.
- C. Unless noted otherwise, shrub and perennials/ornamental grasses shall be irrigated via drip irrigation. Rain sensors and smart controllers shall be included within the irrigation system,
- D. Weather or soil moisture sensors, drip, or low volume irrigation, high-efficiency spray nozzles, and pressure regulated, and check-valve sprinkler bodies must be incorporated as required in new components. Individual sub-zones must be tailored to the watering requirements of each major plant type, and sun/shade exposures and existing terrain shall also be considered when zoning the system. Under no circumstances shall any turf areas be watered in combination with plant beds. Spacing of all sprinkler equipment selected shall never exceed the manufacturer's recommendations as published.
- E. "Head-to-head" coverage is required in all turf areas. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards.
- F. The existing irrigation system will be demolished and replaced. The existing backflow preventor may be reused unless new design warrants replacement. The existing connection at the community center building is 1.5". Contractor shall inspect and verify prior to shop drawing submittal.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Irrigation Design Drawing:
 - 1. Irrigation design to be prepared and drawn by the irrigation contractor in the form of an "Irrigation Design Drawing". The irrigation design drawing shall be submitted in an electronic format. Submit design drawings for approval at least 2 weeks prior to the commencement of any work.
 - 2. The owner's representative and landscape architect may accept the irrigation design drawing as submitted; may mark-up minor corrections and accept the irrigation design drawing as marked-up; or may reject the irrigation design drawing; and require that it be resubmitted.
 - 3. All components of the irrigation system shall be shown. Show sprinkler piping, including plan layout and locations, types, sizes, capacities, and flow characteristics of sprinkler piping components. Include water meters, backflow preventers, booster pumps, valves, piping, sprinkler and devices, drains, accessories, controls, and wiring, as necessary. All components shall be labeled with the component type, manufacturer, and model, or shall be symbols referenced to a legend or key. All components shall be shown with dimensions to reference points. Show areas of sprinkler spray.
 - 4. Overspray of any paved surfaces, as well as overspray onto any structures in the effort to reduce the number of sprinkler heads is prohibited. Drawing shall be scaled no smaller than 1" = 30'-0". In areas where clarity of the design is in question because of the scale, an enlargement of that area shall be shown so as to provide clarity of the design. Approval of Irrigation Design Drawing shall precede commencement of any work.
 - 5. It is the intent to hide all electrical remote valve boxes from view.
- C. Product Data:
 - 1. Irrigation Contractor shall submit three (3) sets of manufacturer's technical data to the Owner's Representative including, but not limited to valves, controller, quick couplers, sprinkler heads, etc.

- D. As-Built Drawing:
 - 1. Irrigation Contractor shall record and submit an "As-Built Drawing" which records actual installed conditions. The As-Built Drawing shall be submitted in an electronic format. Irrigation Contractor shall submit the As-Built Drawing to the Owner's Representative before work under this contract is considered for Final Acceptance.
- E. Operations and Maintenance Manuals:

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: the irrigation system is to be performed and installed by a contractor who specializes in irrigation design and installation and has installed at least 5 projects of equal or comparable size and complexity.
- B. The system shall be designed by a certified EPA WaterSense partner, as found on the EPA WaterSense website, or must be a member of the Irrigation Association (IA) and hold a C.I.D (Certified Irrigation Designer) qualification.
- C. Approval and Selection of Materials and Work: The selection of all materials and the execution of all operations required under this Performance Specification is subject to the approval of the owner's representative who has the right to reject any and all materials and any and all work which, in their opinion, does not meet the requirements of the contract documents at any stage of the operations. Remove rejected work and or materials from project site and replace promptly.

1.8 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.
- C. Handle, load, unload, stack, and transport materials carefully to avoid damage. Handle pipe in accordance with manufacturer's recommendations.

1.9 SLEEVING

- A. It shall be the Irrigation Contractor's responsibility to submit the Irrigation Design Drawing, showing these sleeves, in a timely manner, such that the General Construction Contractor is able to install sleeves within an appropriate sequence of work.
- B. Irrigation sleeves shall be Schedule 40 PVC, minimum 2X pipe size of proposed irrigation pressure pipe. A separate Schedule 40 PVC sleeve shall be installed for irrigation wire. Ends of all irrigation sleeves shall be marked with 2 x 2 wooden stakes or white pvc pipe. Coordination and scheduling for excavation of sleeve ends is the responsibility of the Irrigation Contractor.

1.10 PROJECT CONDITIONS

- A. Prior to commencing any work required under the Contract, the Contractor shall locate all utilities, subsurface drainage, and underground construction so that proper precautions may be taken not to disturb or damage any subsurface improvements. Damage to any of the above-mentioned items or other shall be promptly repaired by the contractor at no additional cost to the owner.
- B. It is the responsibility of the irrigation contractor to coordinate the location of the irrigation waterline and electrical service.
- C. Irrigation System is to operate under the water pressure and flow rates prevailing at the project site. Irrigation Contractor shall be responsible for determining these parameters and shall design the irrigation system in accordance with the existing or anticipated conditions.
 - 1. In the event water pressure is insufficient to operate the system at an adequate design pressure and flow, the Irrigation Contractor shall be responsible for designing, specifying, supplying, and installing a booster pump capable of increasing the pressure and flow as required. Booster pump shall be operated by either a magnetic starter, flow, or pressure transducer/switch. If a booster pump is required, coordinate provisions of adequate electrical service for the pump with General Contractor.
 - 2. In the event the water pressure significantly exceeds an appropriate operating pressure, it shall be Irrigation Contractor's responsibility to provide and install a pressure regulator downstream from the backflow preventer. Pressure regulation may be accomplished via a master valve with a pressure reducing dial or may be accomplished at the individual zone valve locations with a pressure reducing dial.
- D. The Irrigation Contractor is responsible for all costs incurred in replacing damaged or stolen materials or equipment prior to Substantial Completion of the Work.
- E. Obtain all required permits and pay all required fees at no additional cost to the Owner. Any penalties imposed due to failure to obtain permits or pay fees are the responsibility of the Irrigation Contractor.
- F. Existing Site Improvements: Perform Work in a manner that avoids damage to existing site improvements. The Irrigation Contractor is responsible for any damage of mechanical nature as well as damage resulting from leaks in the irrigation system whether due to negligence or otherwise.

1.11 SEQUENCING AND SCHEDULING

- A. Coordinate modifications and installation of irrigation as shown on the Contract Drawings with all other work.
- B. Coordinate layout and installation of irrigation sleeves, conduits and piping under paved areas and other site features prior to their construction.
- C. Coordinate installation of irrigation system with excavation of planting beds and backfilling of planting beds with topsoil.
- D. Coordinate layout and installation of irrigation system with location and installation of plant material to ensure that there will be complete and full irrigation coverage of planting.
- E. Trees shall be located and planted prior to the installation of the irrigation system.

1.12 WARRANTY

- A. Warranty all Work for a period of one (1) year, starting on the Date of Substantial Completion, against defects in materials, equipment, workmanship, and any repairs required resulting from leaks or other defects of workmanship, material, or equipment.
1. Make repairs and replacements and guarantee the satisfactory operation of the entire system in every detail for the 1-year Warranty Period. All warranty repairs and replacements are part of the Contract.
 2. Irrigation Contractor to provide 1st year winterization and following year Spring opening.
 3. Thirty days prior to completion of the plant Warranty Period, the Contractor shall provide a course on the use, adjustment, and maintenance of the automatic controller and irrigation heads. The instructions shall include an on-Site review/walk through of the irrigation system(s) as well as an office session to review the O&M Manual documentation. If the Warranty Period ends during the freezing season, schedule the training within 10 days of the Final Inspection after reactivation of the irrigation system.
 4. Provide Special Tools and Spare Parts:
 - a. 4 percent additional sprinklers and nozzles of each type and spray pattern.
 - b. 2 wrenches for disassembly and adjustment of each type of sprinkler head installed.
 - c. 2 keys for each automatic controller.
 - d. 1 valve box cover key for each 10 valve boxes.
 - e. Backflow device valve handles.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products from one of the following manufacturers:
1. Hunter Industries, Inc.
 2. The Toro Company
 3. Rain Bird Sales, Inc.

2.2 GENERAL

- A. Quality and Size
1. All materials used in the system must be new and without flaws or defects of any type and be the best quality available, and compatible with existing system. All sprays, rotors and valves shall have a minimum three (3) year warranty against material defects or defective workmanship.

2.3 PIPES

- A. PVC Pipe: ASTM D 1785, PVC 1120 compound, Schedules 40 and 80.
1. PE Controlled OD Pipe: ASTM F 771 and ASTM D 3035, PE 3408 compound, DRs 9 and 11.
 2. PE Controlled ID Pipe: ASTM F 771 and ASTM D 2239; PE 3408 compound; SDRs 7, 9, 11.5, and 15.
- B. PIPE AND TUBE FITTINGS
1. PVC Socket Fittings, Schedule 40: ASTM D 2466.
 2. Insert Fittings for PE pipe: ASTM D 2609, NP, or PP. Include bands or other fasteners.
 3. PE Socket Fittings: ASTM D 2683.

2.4 SPRINKLERS

- A. Fixed Spray Sprinkler Head: Manufacturer's standard sprinklers designed for uniform coverage over entire spray area indicated, at available water pressure. Pop-up spray sprinkler shall be of the fixed spray type designed for in-ground installation. Sprinklers shall include a pressure regulating device to prevent high pressure fogging to the nozzle stream.
- B. Spray nozzles: High-efficiency nozzles with a distribution uniformity (DULQ) of 70% or greater shall be used. The higher efficiency nozzle should result in better than a 1.2 SC, reducing runtime accordingly.
- C. Intermediate Turf Rotors: Sprinkler shall be a single stream, water lubricated, gear drive type capable of covering the areas between 25 and 35 feet at a minimum base pressure of 45 psi. The part circle sprinkler shall have adjustable arc coverage of 40 to 360 degrees. The sprinkler shall have a standard rubber cover, tapered stem for positive flushing and a strong stainless steel retract spring for positive pop down.
- D. Long Range Rotors: The full or part circle sprinkler shall be a single stream, water lubricated, gear drive type. The sprinkler shall have a rotating nozzle turret independent of the riser stem. Sprinkler shall be full and part circle operation in a single unit, and when adjusted to the full circle position shall rotate in a single continuous direction.
- E. Components: Corrosion-resistant interior parts.
- F. Flush, surface sprinklers: Fixed pattern, with screw type flow adjustment.
- G. Bubblers: Fixed pattern with screw type flow adjustment
- H. Shrubbery Sprinklers: Fixed pattern, with screw type flow adjustment
- I. Pop-up, Rotary, Spray Sprinklers: Gear drive, full circle, and adjustable part-circle types.

2.5 VALVES AND VALVE SPECIALTIES

- A. Automatic remote-control valves shall operate each zone and shall be sized as per manufacture's recommendations. Valves shall be housed in a valve box with cover marked with zone number. Valves shall be capable of being run manually.
- B. Control-Valve Boxes: PE, fiberglass, polymer concrete, or precast concrete box and cover, with open bottom, openings for piping, and designed for installing flush with grade. Include size as required for valve and service.
 - 1. Drainage backfill: Cleaned gravel or crushed stone, graded from 3 inches maximum to ¾ inch minimum.

2.6 RAIN SENSORS

- A. Automatic Rain Shut-off Device. Rain sensor shall employ an electro-mechanical actuating mechanism designed to cause a circuit interrupt if programmable rainfall set points are satisfied.
- B. The wireless rain sensor shall incorporate a provision that allows the installer to select from several rainfall settings that can be programmed through the use of icons on a controller interface.

2.7 AUTOMATIC CONTROL SYSTEM

- A. Controller Stations for Automatic Control Valves: Irrigation controller shall have a modular station capacity. The controller shall be a hybrid type, housed in a wall-mountable, weather resistant plastic cabinet with a key-locking cabinet.
- B. Timing Device: Adjustable, 24-hour, 14-day clock with automatic operations to skip operation any day in timer period; to operate every other day; or to operate two or more times daily.
- C. Wiring: UL 493, Type UF, solid-copper-conductor, insulated CAE, suitable for direct burial.

2.8 QUICK COUPLERS

- A. Description: Factory-fabricated, bronze or brass, two-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.

2.9 DRIP IRRIGATION SPECIALTIES

- A. Freestanding Emitters: Device to deliver water at approximately 20 psig.
 - 1. Body Material: PE or vinyl, with flow control.
- B. Manifold Emitter Systems: Manifold with tubing and emitters.
 - 1. Manifold: With multiple outlets to deliver water to emitters.
 - a. Body Material: Plastic.
 - b. Outlet Caps: Plastic, for outlets without installed tubing.
 - c. Operation: Automatic pressure compensating.
 - 2. Tubing: PE or PVC; 1/8-inch minimum ID.
 - 3. Emitter: Device to deliver water at approximately 20 psig.
 - a. Body Material: PE or vinyl, with flow control.
- C. Multiple-Outlet Emitter Systems: Emitter with tubing and button-type outlets.
 - 1. Emitter: With multiple outlets to deliver water to remote outlets.
 - a. Body Material: Plastic, with flow control.
 - b. Outlet Caps: Plastic, for outlets without installed tubing.
 - c. Operation: Automatic pressure compensating.
 - d. Emitters: Devices to deliver water at approximately 20 psig

PART 3 - EXECUTION

3.1 GENERAL

- A. Supervision: Provide a full - time superintendent and necessary assistants on the job while Work is in progress. Irrigation contracting firm shall have a C.I.C. (certified irrigation contractor) on site at all times and must be an employee of said irrigation contracting company. The Superintendent represents the Irrigation Contractor in all functions, and directives given to him by the Owner's Representative, Landscape Architect, General Construction Contractor, and / or Landscape Contractor are binding as if given to the Irrigation Contractor in person
- B. Inspection of Work in progress: During installation the Owner's Representative or the Landscape Architect may review and observe the Work on a regular or random basis, and may reject any work and / or materials that do not meet the requirements of the Contract Documents. Rejected Work must be promptly corrected. No time extension will be allowed replacement or repair of rejected work.

3.2 REVIEW IN ADVANCE OF CONSTRUCTION

- A. The Irrigation Contractor shall review the Project Site prior to start of Work to determine that all site conditions are acceptable for Irrigation Work to begin. Inform the Owner's Representative and the Landscape Architect of any and all unsuitable conditions. Do not proceed with installation of irrigation system until unsatisfactory conditions have been corrected in an acceptable manner.

3.3 PREPARATION

- A. Flag all existing underground utilities prior to trenching and / or boring operations. Obtain locations of any new utilities from the Owner's Representative and / or the General Contractor. Irrigation Contractor is solely responsible for contacting the utility locating service(s) and Owner's Representative (with 48 hours minimum notification) and locating on - site utilities in advance of installation.

3.4 SLEEVING

- A. Location of sleeving shall be coordinated with the General Construction Contractor. Make adjustments necessary to accommodate existing vegetation, utilities, and other existing conditions.
- B. Repair of damage to existing utilities, structures or other construction resulting from installation of sleeves is the responsibility of the Contractor installing the sleeving.

3.5 TRENCHING

- A. All mainline to be installed in separate trenching process from lateral lines.
- B. During the entire prosecution of the work, the Contractor will be responsible for all open excavations and as a means of protection, shall keep such protective devices buried at proper intervals along the excavation to protect the public from injury.

- C. Trenching and excavation in established grass or newly seeded areas: After trenching, excavation and backfilling is completed, re-grade trenched area consistent with surrounding area and reseed with turf seed matching existing grass or seed. Mulch seed after broadcasting.
- D. Trenching and excavation through existing asphalt or concrete: Cutting, removal and replacement of asphalt or concrete is the responsibility of the Irrigation Contractor.
- E. Trenching and excavation near existing trees: Irrigation Contractor shall paint the proposed trenching or excavation which occurs within the "drip line" or within fifty (50) feet of the trunks of the existing trees (8" caliper or larger). Irrigation Contractor must contact the Owner's Representative for review of the proposed trenching and excavation lines prior to proceeding with the work. Owner's Representative may adjust proposed trenching and excavation lines in order to avoid damage to tree root systems and other plants. Such adjustments shall be made by the Irrigation Contractor at no additional cost to the Owner.
- F. Install warning tape directly above pressure piping, 12 inches below finished grades, except 6 inches below subgrade under pavement and slabs.
- G. Provide minimum cover over top of underground piping according to the following:
 - 1. Minimum depth of cover of pipe is as follows:
 - a. One – half (1/2) to one (1) inch: Twelve inches
 - b. One and one – quarter (1 ¼) to two (2) inch: Fifteen inches
 - c. 3 & 4 inch: Twenty-four inches.

3.6 PIPING INSTALLATION

- A. Pipe joints
 - 1. Follow manufacturer's recommendations and use pipe and bell from the same manufacturer. Pipes two and one - half (2 1/2) inches and smaller use solvent weld system. Pipes three (3) inches and larger use approved compression type push on joints.
- B. Solvent weld PVC Pipe, assemble according to Manufacturer's recommendations, using appropriate PVC pipe cleaner/primer and solvent cement.
- C. Pipes and Fittings
 - 1. Install according to Manufacturer's recommendations including snaking in of PVC pipe to prevent excessive strain when contracting in cold weather.
 - 2. Solvent weld fittings shall conform to Schedule 40 or Schedule 80 PVC dimensions and specifications for solvent weld fittings.
- D. Lateral Lines and Risers
 - 1. Install according to Manufacturer's recommendations using standard techniques.
 - 2. Install risers such that no excessive movement occurs while sprinkler head is in operation. Height of risers to be in accordance with planned and existing plant material. Height of all risers is subject to approval of Landscape Architect.
 - 3. Plug lines immediately upon installation to minimize infiltration of foreign matter.
 - 4. Flush lateral lines and risers prior to installation of sprinkler heads.

3.7 VALVE BOXES

- A. All valves are to be housed in valve boxes. Install according to Manufacturer's recommendations. Position boxes at a height where they will not interfere with maintenance machinery (e.g., mowers) and such that soil and mulch do not wash into the box.

3.8 SPRINKLER HEADS

- A. Sprinklers with a 1" and larger bottom inlet shall be installed on swing joints, minimum 3" off inside edge of curbs, drives and sidewalks. Sprinkler with a 3/4" and smaller inlet may be installed using flexible swing joints.
- B. Low Pop-up Sprinkler Heads: Install in such manner that top is flush with finish grade. Where finish grade has not been established extend riser a minimum of twelve (12) inches above existing grades to mark location of head. After finish grade is established install heads at specified height.
- C. High Pop-up Shrub Heads: Finish height to be proposed by Irrigation Contractor as a function of plants specified on landscape plans and noted on irrigation design submittal.
- D. Backfill around sprinkler head assembly in such manner as to stabilize the sprinkler head so that no lateral motion occurs during operation.
- E. Sprinkler heads on risers: Utilize a schedule 80 T.O.E. nipple. If greater than 24" height is required, provide fitting in the ground with a solvent weld 90-degree elbow with the appropriate length of pipe glued to it and coming out of the ground to the desired height. Glue male adapter to the riser to allow for the connection of the sprinkler head. Stabilize riser by fastening it to rebar as required. Height of all heads in bed areas to be proposed by Irrigation Contractor as a function of plants specified on landscape plans.
- F. Landscape Drip Line shall be located in a manner that will provide optimum concentration of water to plant material.

3.9 DRIP IRRIGATION INSTALLATION

- A. Install freestanding emitters on pipe riser to mounting height indicated.
- B. Install manifold emitter systems with tubing to emitters. Plug unused manifold outlets. Install emitters on off-ground supports at height indicated.
- C. Install multiple-outlet emitter systems with tubing to outlets. Plug unused emitter outlets. Install outlets on off-ground supports at height indicated.
- D. Install drip tubes with direct-attached emitters on ground.
- E. Install drip tubes with remote-discharge on ground with outlets on off-ground supports at height indicated.
- F. Install off-ground supports of length required for indicated mounted height of device.

3.10 BACKFLOW PREVENTER

- A. Installation in accordance with manufacturer's recommendations and all federal, state, and local codes.

3.11 AUTOMATIC IRRIGATION-CONTROL SYSTEM INSTALLATION

- A. Equipment Mounting: Install interior controllers on wall.
- B. Install control cable in same trench as irrigation piping and at least 2 inches below or beside piping. Provide conductors of size not smaller than recommended by controller manufacturer. Install cable in separate sleeve under paved areas.

3.12 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Any irrigation product will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.13 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Verify that controllers are installed and connected according to the Contract Documents.
 - 3. Verify that electrical wiring installation complies with manufacturer's submittal.
 - 4. Avoid overwatering during the establishment period. Too often, the plantings are overwatered while the sod becomes established (typically 2 weeks after installation). Once the sod is established cut back the irrigation water times and frequency.

3.14 ADJUSTING

- A. Adjust settings of controllers.
- B. Adjust automatic control valves to provide flow rate at rated operating pressure required for each sprinkler circuit.
- C. Adjust sprinklers and devices, except those intended to be mounted aboveground, so they will be flush with, or not more than 1/2 inch above, finish grade.

3.15 CLEANING

- A. Flush dirt and debris from piping before installing sprinklers and other devices.

3.16 WINTERIZING SYSTEM

- A. For the first winter season, the irrigation contractor is to winterize the irrigation piping by blowing the system clear of water using compressed air (eighty (80) psi maximum) admitted into the piping at a quick coupling valve or hose bib located at a higher elevation on the system piping. Activate individual zones, higher zones first, then proceed

successively through the system towards lower elevations. Proceed through all zones twice. The air compressor used to winterize the system must have an engine separate from the compressor tanks to prevent high temperature air from being injected directly into the PVC piping.

- B. Irrigation Contractor shall provide a complete spring start up at no additional charge. Owner's maintenance staff must be present at the time of the winterizing and spring start up.

3.17 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain automatic control valves and controllers.

3.18 INSPECTION AND ACCEPTANCE

- A. Upon completion of Work, the Contractor shall notify the Owner's Representative and the Landscape Architect at least ten (10) days prior to requested date of review for Substantial Completion of all portions of the work. Landscape Architect will issue a punch list for work to be corrected. All work on the punch list must be completed within ten (10) working days from the date of inspection. Where Irrigation Work does not comply with requirements, replace rejected Work. In unusual circumstances a longer time period may be granted by the Owner's Representative. If such replacements are not completed within the time specified, the Irrigation Contractor may be considered to be in default of the Contract, and the Owner's Representative may use the contract retainage to hire other Contractors to finish the Work.
- B. It will be the responsibility of the Irrigation Contractor to provide a reliable communication system (i.e., two-way radios or remote radio control activation system) for Substantial Completion and Final Inspections.
- C. If an inspection / acceptance walk-thru has been scheduled and the Landscape Architect arrives at the site and determines that the Irrigation System is not substantially complete (all system components in place, operational, and checked with 100% sprinkler coverage), the Irrigation Contractor shall be responsible for all costs incurred by the Landscape Architect to revisit the site at a future date. Reimbursable expenses include, but are not limited to, automobile mileage, airfare, landscape architect's hourly billing rate, parking fee, meals, rental car, etc. All incurred expenses will be deducted from the final contract amount or the contract retainage.
- D. Certificate of Substantial Completion will be issued for satisfactory completion of repairs and replacements and completion of As-Built Drawings. If punch list items are issued with the Certificate, they must be corrected within ten (10) working days.
- E. Final Acceptance: Two years after Date of Substantial Completion of the Work, the Owner's Representative will review the Work for Final Acceptance. The Final Acceptance Certification issued by the Owner's Representative/Landscape Architect will serve as evidence that Contractor's two (2) year warranty obligations have been met.

END OF SECTION 32 84 00

SECTION 32 91 13 - SOIL PREPARATION

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.

1.2 SUMMARY

- A. Section includes:
 - 1. Planting Soils
 - 2. Planting Soils Testing
 - 3. Planting Soil Preparation
- B. Related Requirements:
 - 1. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.
 - 2. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.
 - 3. Section 329300 "Plants" for placing planting soil for plantings.

1.3 DEFINITIONS

- A. AAPFCO: Association of American Plant Food Control Officials.
- B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- C. CEC: Cation exchange capacity.
- D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.
- E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.
- F. Imported Soil: Soil that is transported to Project site for use.
- G. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.
- H. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
- I. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.
- J. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."

- K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- L. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.
- M. SSSA: Soil Science Society of America.
- N. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- O. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- P. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- Q. USCC: U.S. Composting Council.

1.4 QUALITY ASSURANCE

- A. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the **State of Minnesota**, Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

1. Soil Analysis

- B. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; soluble salts; deleterious material; pH; and mineral and plant-nutrient content of the soil.
 - 1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 - 2. Depth, location, and number of samples to be taken per instructions from Landscape Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 - 3. Report suitability of tested soil for plant growth.
 - a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Test for presence of soluble salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include recommendations for application and use.

2. Include test data substantiating that products comply with requirements.
 3. Include sieve analyses for aggregate materials.
 4. Material Certificates: For each type of imported soil and soil amendment and fertilizer before delivery to the site, according to the following:
 - a. Manufacturer's qualified testing agency's certified analysis of standard products.
 - b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
 - c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.
- B. Samples: For each bulk-supplied material, 1-quart volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.
- 1.7 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For each testing agency.
 - B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.
 - C. Field quality-control reports.
- 1.8 TESTING AGENCY QUALIFICATIONS
- A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.
- 1.9 PRECONSTRUCTION TESTING
- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction soil analyses on existing on-site soil.
 1. Notify Landscape Architect seven days in advance of the dates and times when laboratory samples will be taken.
 - B. Preconstruction Soil Analyses: For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
 1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.
- 1.10 SOIL-SAMPLING REQUIREMENTS
- A. Sample Collection and Labeling: Have samples taken and labeled by Contractor under the direction of the testing agency.

1. Number and Location of Samples: Minimum of three representative soil samples from varied locations for each soil to be used or amended for landscaping purposes.
2. Procedures and Depth of Samples: According to USDA-NRCS's "Field Book for Describing and Sampling Soils."
3. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

1.11 TESTING REQUIREMENTS

A. Physical Testing:

1. Soil Texture: Soil-particle, size-distribution analysis by one of the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":
 - a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
 - b. Hydrometer Method: Report percentages of sand, silt, and clay.
2. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
3. Water Retention: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
4. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods"; at 85% compaction according to ASTM D 698 (Standard Proctor).

B. Fertility Testing: Soil-fertility analysis according to standard laboratory protocol of SSSA NAPT NCR-13, including the following:

1. Percentage of organic matter.
2. CEC, calcium percent of CEC, and magnesium percent of CEC.
3. Soil reaction (acidity/alkalinity pH value).
4. Buffered acidity or alkalinity.
5. Nitrogen ppm.
6. Phosphorous ppm.
7. Potassium ppm.
8. Manganese ppm.
9. Manganese-availability ppm.
10. Zinc ppm.
11. Zinc availability ppm.
12. Copper ppm.
13. Sodium ppm and sodium absorption ratio.
14. Soluble-salts ppm.
15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
16. Other deleterious materials, including their characteristics and content of each.

C. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3-Chemical Methods."

D. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.

1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. for 6-inchdepth of soil.
2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. for 6-inchdepth of soil.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.
- B. Bulk Materials:
 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 3. Do not move or handle materials when they are wet or frozen.
 4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 2 - PRODUCTS

2.1 PLANTING SOILS

- A. General: Soil amendments, fertilizers, and rates of application specified in this article are guidelines that may need revision based on testing laboratory's recommendations after preconstruction soil analyses are performed.
- B. EXISTING ON-SITE PLANTING SOIL: Existing, on-site surface soil, with the duff layer, if any, retained; and stockpiled on-site; modified to produce viable planting soil:
 1. Unacceptable Properties: Clean soil of the following:
 - a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
 - b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 8 percent by dry weight of the imported soil.
 - c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 6" in any dimension.
 2. Amended Soil Composition: Blend imported, unamended soil with the following soil amendments and fertilizers (PER TESTING RESULTS) in the following quantities to produce planting soil:
 - a. Compost.
 - b. Sphagnum
 - c. Lime.
 - d. Sulfur/Iron Sulfate.
 - e. Agricultural Gypsum.
 - f. Superphosphate.
 - g. Commercial Fertilizer.

-
- h. Slow-Release Fertilizer.
- A. IMPORTED PLANTING SOIL: Shall be natural, friable, fertile, fine, sandy loam possessing the characteristics of representative topsoil in the vicinity which produce heavy growths of vegetation. The topsoil shall be free from subsoil, clay lumps, clods, weeds, brush, tree roots, branches, stones larger than 1-inch in any dimension, lime, concrete, ashes, slag, or other deleterious matter and shall be well drained in its original conditions and free of toxic quantities of acid or alkaline elements.
1. Sources: Unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches deep, not from agricultural land, bogs, or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass.
 2. Unacceptable Properties: Manufactured soil shall not contain the following:
 - a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
 - b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 5 percent by dry weight of the manufactured soil.
 - c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 1-1/2 inches in any dimension.
- B. SOIL TYPE 01: 6" Existing On-Site Planting Soil – Native/Turf Areas
1. Source: Existing on-site topsoil prepared in-situ or from stockpiled topsoil.
 2. Prepared Depth: 6 inches
 - a. Remove existing turf/herbaceous vegetation. Prepare soils to a depth of 6" in areas to receive turf / native seeding. Do not till below existing trees, hand rake / light harrow only.
 3. Composition: Utilize in-situ soils or respread stockpiled soils. Contractor shall be responsible for hauling, mixing and placement.
- C. SOIL TYPE 02: 18" Existing On-Site Planting Soil, Amended- Perennial Areas
1. Source: Existing on-site topsoil amended and prepared in-situ or from stockpiled topsoil.
 2. Prepared Depth: 18 inches
 - a. Utilize in-situ soils or Re-spread stockpiled soils. Amend in-situ to depth of 18" to provide viable planting soil at perennial planting beds, tree, and shrub planting areas.
 3. Composition: Conform to MNDOT Spec 3877.2B (Table 3877-2). "Loam Topsoil Borrow". Contractor shall be responsible for hauling, mixing and placement.
- D. SOIL TYPE 03: 6" In-Situ Amended Soils – Air Spade
1. Source: Existing on-site topsoil amended and prepared in-situ.
 2. Prepared Depth: 6 inches
 - a. Utilize in-situ soils. Loosen soils using air spade to depth of 6" at areas to receive planting.
 3. Composition: Existing on-site soils, retained in-situ amended with 1/2" compost topdressing.

2.2

A. LOAM TOPSOIL BORROW:

1. Provide topsoil borrow consisting mostly of loam ranging into sandy clay loam, sandy loam, Silt loam, and clay loam soils as a plant growing medium for landscape and planting beds and in accordance with Table 3877.2-2:

**Table 3877.2-2
Loam Topsoil Borrow Requirements**

Requirement	Range	Test Method
Material Passing the 3/4 inch	100 percent	ASTM D422*
Material passing No. 4	≥ 90 percent	-
Clay	5 – 35 percent	ASTM D422*
Silt	10 – 60 percent	ASTM D422*
Sand	15 – 60 percent	ASTM D422*
Organic matter	3 – 15 percent	ASTM D2974
pH	6.1 – 7.5	ASTM G51†
Soluble salts	≤ 0.15 siemens/meter	—
* ASTM D422, Standard Test Method for Particle-Size Analysis of Soils ASTM D2974, Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils † ASTM G51, Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing		

Contractor shall be responsible for hauling, mixing and placement.

2. Additional Amendments: Amendments according to soil test recommendations and as approved by landscape Architect.
3. Planting Preparation: After preparing subgrade and placing soils according to this section, prepare soils for planting according to: See Section 329300 - Plants”.

2.3 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 1. Class: O, with a minimum of 95 percent passing through a No. 8 sieve and a minimum of 55 percent passing through a No. 60 sieve.
 2. Form: Provide lime in form of ground dolomitic limestone.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.

- F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.
- G. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C 33/C 33M.

2.4 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source separated or compostable mixed solid waste.
 - 2. Organic-Matter Content: 30 to 60 percent of dry weight.
- B. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.5 FERTILIZERS

- A. Bonemeal: Commercial, phosphate mixture, soluble; a minimum of 4 percent nitrogen.
- B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
- C. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

PART 3 - EXECUTION

3.1 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.
 - 1. Install minimum 6" planting soils to amend existing soils in all perennial planting beds, and tree and shrub planting areas.
 - 2. Install minimum of 4" topsoil in areas to receive sod / turf seeding.
- B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

- C. Proceed with placement only after unsatisfactory conditions have been corrected.

3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

- A. Excavation: Excavate soil from designated area(s) to a depth as required to allow installed soil depths specified by plant material.
 - 1. Where feasible and in alignment with soils types, retain existing soils in-situ and protect and prepare in-place. See "BLENDING PLANTING SOIL IN PLACE".
- B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
- C. Unsuitable Materials: Clean soil to contain a maximum of 8 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.
- D. Screening: Pass unamended soil through a 2-inch sieve to remove large materials.

3.3 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

- A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of 4 inches. Remove stones larger than 6 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Do not till below the dripline of existing trees.
 - 2. Apply, add soil amendments, and mix approximately half the thickness of unamended soil over prepared. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil.
- C. Mixing: Spread unamended soil to total depth of 6 inches, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
 - 1. Amendments: Apply soil amendments, except compost, and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.
 - a. Mix lime and sulfur as required with dry soil before mixing fertilizer.
 - b. Mix fertilizer with planting soil no more than seven days before planting.
 - 2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 8 inches in loose depth for material compacted by compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.
- D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 and tested in-place except where a different compaction value is indicated on Drawings.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.4 BLENDING PLANTING SOIL IN PLACE

- A. General: Mix amendments with in-place, unamended soil to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Preparation: Till unamended, existing soil in planting areas to a minimum depth of 4 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Use air spade to prepare soil in planting areas located within dripline of trees to preserve root zones.
 - 2. Do not till below dripline of existing trees.
- C. Mixing: Apply soil amendments, except compost, and fertilizer, if required, evenly on surface, and thoroughly blend them into full depth of unamended, in-place soil to produce planting soil.
 - 1. Mix lime and sulfur with dry soil before mixing fertilizer.
 - 2. Mix fertilizer with planting soil no more than seven days before planting.
- D. Compaction: Compact blended planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 except where a different compaction value is indicated on Drawings.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.5 APPLYING COMPOST TO SURFACE OF PLANTING SOIL

- A. Application: Apply compost component of planting-soil mix to surface of in-place planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Finish Grading: Grade surface to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections:
 - 1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D 698. Space tests at no less than one for each 1000 sq. ft. of in-place soil or part thereof.
- C. Soil will be considered defective if it does not pass tests and inspections.

3.7 PROTECTION AND CLEANING

- A. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Vehicle traffic.

4. Foot traffic.
 5. Erection of sheds or structures.
 6. Impoundment of water.
 7. Excavation or other digging unless otherwise indicated.
- B. If planting soil or subgrade is over compacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Landscape Architect and replace contaminated planting soil with new planting soil.

3.8 CLEANING

- A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION 32 91 13

SECTION 32 92 00 - TURF AND GRASSES

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.

1.2 SUMMARY

- A. Section Includes:
 - 1. Turf Seeding.
 - 2. Hydroseeding.
 - 3. Turf renovation.
- B. Related Requirements:
 - 1. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" and drawing designations for planting soils.
- E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 REFERENCED STANDARDS

- A. AOSA: Association of Official Seed Analysts.
 - 1. Rules for Testing Seeds, Tetrazolium Testing Handbook
- B. FSA: Federal Seed Act.
 - 1. Labeling Sections 201.8 to 201.31.
- C. TPI: Turfgrass Producers International.

1. Guideline Specifications to Turfgrass Sodding.
- 1.5 PREINSTALLATION MEETINGS
 - A. Preinstallation Conference: Conduct conference at Project site. If needed, insert list of conference participants not mentioned in Section 013100 "Project Management and Coordination."
 - 1.6 INFORMATIONAL SUBMITTALS
 - A. Qualification Data: For landscape Installer.
 - B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
 1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.
 - C. Product Certificates: For fertilizers, from manufacturer.
 - D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.
 - 1.7 CLOSEOUT SUBMITTALS
 - A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.
 - 1.8 QUALITY ASSURANCE
 - A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 2. Experience: Five years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 4. Personnel Certifications: Installer's field supervisor and personnel assigned to the Work shall have certification in all of the following categories from the Professional Landcare Network:
 - a. Landscape Industry Certified Technician - Exterior.
 - b. Landscape Industry Certified Lawncare Manager.
 - c. Landscape Industry Certified Lawncare Technician.
 5. Pesticide Applicator: State licensed, commercial.
 - 1.9 DELIVERY, STORAGE, AND HANDLING
 - A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.
- C. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways, and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk materials with appropriate certificates.

1.10 FIELD CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Spring Planting: Ground thaw to June 15th.
 - 2. Fall Planting (Sodding): August 15 to November 1.
 - 3. Fall Planting (Seeding): August 15 to September 15.
 - 4. Summer planting may be allowed if site irrigation is included within the project. Obtain landscape architect approval if planting outside of the dates listed above.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 TURFGRASS SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species:
 - 1. Quality: State-certified seed of grass species as listed below for solar exposure.
 - 2. Quality: Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
 - 3. Sun and Partial Sun: Proportioned by weight as follows:
 - a. 50 percent Kentucky Bluegrass (*Poa pratensis*).
 - b. 30 percent Chewings Red Fescue (*Festuca rubra* variety).
 - c. 10 percent Perennial Ryegrass (*Lolium perenne*).
 - d. 10 percent Redtop (*Agrostis alba*).
 - 4. Shade: Proportioned by weight as follows:
 - a. 30 percent Hard Fescue (*Festuca brevipila*).
 - b. 30 percent Perennial Ryegrass (*Lolium perenne*).
 - c. 20 percent Chewings Red Fescue (*Festuca rubra* variety).

- d. 20 percent Kentucky Bluegrass (*Poa pratensis*).

2.2 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Sphagnum Peat Mulch: Do not use peat mulch.
- C. Muck Peat Mulch: Do not use peat mulch.
- D. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- E. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- F. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.
- G. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.4 PESTICIDES

- A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.5 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a natural cotton mesh. Include manufacturer's recommended steel wire staples, 6 inches long.
- B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable, or which is dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 - 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."
 - 1. Reduce elevation of planting soil to allow for soil thickness of sod.
- B. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- C. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

- A. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.
- B. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- C. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
 - 1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 2. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of 4 to 6 lb/1000 sq. ft. Or supplier's recommendations if different.
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets and 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.
- E. Protect seeded areas with erosion-control mats where indicated on Drawings; install and anchor according to manufacturer's written instructions.
- F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
 - 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
 - 2. Bond straw mulch by spraying with asphalt emulsion at a rate of 10 to 13 gal./1000 sq. ft. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.
- G. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.

3.6 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, commercial fertilizer, slow-release fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
 - 1. Mix slurry with nonasphaltic tackifier.
 - 2. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.
 - 3. Spray-apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre dry weight, and seed component is

deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre.

3.7 TURF RENOVATION

- A. Renovate existing turf where indicated.
- B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
 - 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
 - 2. Install new planting soil as required.
- C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- E. Mow, dethatch, core aerate, and rake existing turf.
- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.
- I. Apply soil amendments and initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
- J. Apply seed and protect with straw mulch or sod as required for new turf.
- K. Water newly planted areas and keep moist until new turf is established.

3.8 TURF MAINTENANCE

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.

2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 1. Mow Kentucky bluegrass to a height of 1-1/2 to 2 inches.
- D. Turf Postfertilization: Apply commercial fertilizer after initial mowing and when grass is dry.
 1. Use fertilizer that provides actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

3.9 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
 2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.10 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.11 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- D. Remove nondegradable erosion-control measures after grass establishment period.

3.12 MAINTENANCE SERVICE

- A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:
1. Seeded Turf: 60 days from date of Substantial Completion.
 - a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
 2. Sodded Turf: 30 days from date of Substantial Completion.

END OF SECTION 32 92 00

SECTION 329219 – NATIVE SEEDING

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.

1.2 SUMMARY

- A. Section Includes:
 - 1. Native Seeding and Seedbed preparation for native areas.
 - 2. Cover Crops.
 - 3. Native Wildflower Plugs.
 - 4. Mulching and erosion control.

- B. Related Requirements:
 - 1. Division 32 91 13 "Soil Preparation " for placing soils for native areas.
 - 2. Division 32 92 00 "Turfs and Grasses" for site preparation for turf and grasses.
 - 3. Division 32 93 00 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.

1.3 REFERENCES

- A. Minnesota Department of Transportation, Standard Specifications for Construction, 2018 Edition. Sections regarding landscaping, seeding, sodding and erosion control shall govern.
- B. Minnesota Department of Transportation, 2014 Seeding Manual, Office of Environmental Services, Erosion Control Unit.
- C. Local Municipal Ordinances and Conditions of Site Plan Approval, when applicable.

1.4 DEFINITIONS

- A. Dormant Seeding: Seeding allowed in the late fall when the ground temperature is too low to cause seed germination so that the seed remains in a dormant condition until spring
- B. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- C. Finish Grade: Elevation of finished surface of planting soil.
- D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

- E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- F. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments to produce a soil mixture best for plant growth. See **Section 329113 "Soil Preparation"** and drawing designations for planting soils.
- G. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- H. Subsoil: Soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- I. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For native landscape restoration Installer.
- B. Certification of Native Seed: From seed vendor for each mixture stating the botanical and common name, percentage by weight of each species and variety, Origin (county of genetic origin for native species) and percentage of purity, germination, and pure live seed. Include the year of production and date of packaging.
 - 1. Certification of each seed mixture for native prairie and woodland include identification of source and name and telephone number of supplier.
 - 2. Seed shall be supplied from a vendor subject to compliance with requirements, and selected from the following:
 - a. Prairie Moon Nursery
 - b. Shooting Star Native Seeds
 - c. Prairie Restoration, Inc.
 - d. Or approved equal
- C. Growers Certification:
 - 1. Compliance with State and Federal quarantine restrictions.
 - 2. Data showing grass and wildflower species and location of field from which seed and seedlings were harvested.
- D. Documentation that the mulch is certified by the Minnesota Crop Improvement Association (MICA).
- E. Material Test Reports: For existing native surface topsoil imported or manufactured topsoil, refer to soils specifications.
- F. Maintenance Records: For all establishment maintenance activities in prairie planting area. Submit records following each maintenance visit.
- G. Product Certificates: For fertilizers, soil amendments, and erosion control products, from manufacturer.

- H. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.
- I. Schedule: Contractor to supply a seeding/seedling schedule, including dates and method of seeding to be approved by Landscape Architect prior to installation of seeding.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of native plantings during a calendar year. Submit before expiration of required maintenance periods.

1.8 QUALITY ASSURANCE

- A. Native Seeding Contractor. A qualified landscape restoration installer/ native seeding contractor seeding the native prairie areas who wishes to bid this project must document the following:
 - 1. Expertise:
 - a. Installer's business shall specialize in native plant community restoration and ecologically based land management practices, including native seeding and establishment maintenance.
 - b. The installer has access to the equipment necessary for installing and maintaining a native landscape.
 - c. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association, Member in Society of Ecological Restoration affiliate chapter or equivalent organization.
 - 2. Experience:
 - a. Installer shall have at least five years of experience planting native landscape installations of similar scope and size to this project. Demonstrated experience in at least 5 successfully completed native prairie installations with good species diversity and a low occurrence of non-natives with addresses and client contact information of the projects. The installer shall provide a project owner contact with address and phone number.
 - 3. Installation & Maintenance Supervisor:
 - a. This person must be present full-time during installation and maintenance procedures.
 - b. This person must hold a Bachelors degree in Natural Resources Management or related discipline.
 - c. This person must have a minimum of 5 years experience in landscape restoration and maintenance supervision with experience or training in prairie and lakeshore management, entomology, pest control, soils, fertilizers and plant identification.
 - d. This person must hold a current licenses & certification in:
 - 1) Pesticide Applicator: State licensed, commercial.
 - 2) MNDOT Certified Landscape Specialist
 - 4. Labor Force: Shall be thoroughly familiar with and trained in the work to be accomplished and perform in a competent, efficient manner acceptable to the Landscape Architect.
- B. Seed testing and Viability: Provide seed tested in accordance with the official rules for testing on file with the AOSA and meeting the minimum germination requirements of 3876.2.F, "Minimum PLS," during installation. Plant seed within 12 months of viability testing exclusive of the month the test was completed.
- C. Soil Testing and Analysis: For each unamended soil type, Contractor shall furnish soil analysis and a written report 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 the soil in accordance with related sections.
 - a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated.

- b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

D. All substitutions are subject to the approval of the Landscape Architect.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.
 - 1. Store seed and inoculant under controlled conditions. Before planting, maintain seed at or below 70 °F [21 °C] and at or below 10 percent moisture content, and protect seed from rain, direct sunlight, rodents, and insects.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk materials with appropriate certificates.

1.10 FIELD CONDITIONS

- A. Topsoil shall be spread and site shall be fine graded by General Contractor or by his/her subcontractor. See Section 3.1 of this specification.
- B. Any site preparation by the seeding contractor shall be construed as acceptance of existing conditions.
- C. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
 - 1. Spring Planting: April 15- July 20th
 - 2. Fall Planting: Sept 20-Oct. 20th
- D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

- 2.1 RANGE LIMITED: Seed mix and Seedlings are range-limited to ensure native seed matching the ecotype found in region.
 - 1. Seed and seedling components have a genetic origin from within **150** miles of project site.

2.2 SEED

- A. Native Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances and following characteristics:

1. Meeting the requirements of Minnesota Statutes 21.80-21.91 and any applicable federal regulations, including those governing labeling and weed seed tolerances;
 2. Conditioned to remove all pieces of stem, straw, or other chaff longer than 1½ in [38 mm] so that it can pass through a drill seeder without plugging;
 3. Supplied on a pure live seed (PLS) basis; and
 4. Meeting the tolerance requirements for germination and purity factors of Minnesota Seed Law.
- B. Approved Suppliers: Subject to compliance with requirements, select from the following:
1. Prairie Moon Nursery
 2. Shooting Star Native Seeds
 3. Prairie Restoration, Inc.
- C. Seed mixes:
1. **Native Seed Mix Type 1:** “BWSR Urban Prairie Seed Mix, modified for shade”. Fresh, clean, and dry new seed, of mixed species as follows:

35-121 Little Bluestem Urban Prairie Mix		
Common Name	Scientific Name	% of Mix by PLS
Sideoats Grama	<i>Bouteloua curtipendula</i>	2.84%
Blue Grama	<i>Bouteloua gracilis</i>	1.28%
Prairie Brome	<i>Bromus kalmii</i>	3.21%
Common wood sedge	<i>Carex blanda</i>	2.00%
June Grass	<i>Koeleria macrantha</i>	0.25%
Little Bluestem	<i>Schizachyrium scoparium</i>	8.36%
	Grasses Subtotal	17.94%
Columbine	<i>Aquilegia canadensis</i>	0.10%
Butterfly Milkweed	<i>Asclepias tuberosa</i>	0.19%
Whorled Milkweed	<i>Asclepias verticillata</i>	0.03%
Canada Milkvetch	<i>Astragalus canadensis</i>	0.10%
White Prairie Clover	<i>Dalea candida</i>	0.19%
Purple Prairie Clover	<i>Dalea purpurea</i>	0.32%
Sweet Joe Pye Weed	<i>Eutrochium purpureum</i>	0.30%
Wild Geranium	<i>Geranium maculatum</i>	0.20%
Rough Blazing Star	<i>Liatris aspera</i>	0.12%
Wild Bergamot	<i>Monarda fistulosa</i>	0.30%
Large-flowered Beardtongue	<i>Penstemon grandiflorus</i>	0.19%
Black-eyed Susan	<i>Rudbeckia hirta</i>	0.67%
Gray Goldenrod	<i>Solidago nemoralis</i>	0.09%
Upland White Goldenrod	<i>Solidago ptarmicoides</i>	0.16%
Heath Aster	<i>Symphotrichum ericoides</i>	0.12%
Smooth Blue Aster	<i>Symphotrichum laeve</i>	0.12%
Prairie Spiderwort	<i>Tradescantia bracteata</i>	0.50%
Hoary Vervain	<i>Verbena stricta</i>	0.17%
Heartleaf Alexanders	<i>Zizia aptera</i>	0.19%
	Forbs Subtotal	4.06%
Oats/Winter Wheat	<i>Avena sativa/Triticum aestivum</i>	78.00%
	Cover Crop Subtotal	78.00%
	Total	100.00%

- a. Description: Native seeding with perennial plugs enhancements. Plugs to be planted in mixed species masses (50-100SF) at select locations throughout (25%) of planting area.

- b. Seeding Rate: Seed at 12 lbs/acre* + Cover Crop - Seed at increased seeding rate to support seed bank creation.

2.3 COVER CROP

- 1. If not included in seed mix, provide cover crop:
 - a. Dormant Seeding & Early Spring (Snow seeding): Annual rye at 25 lbs per acre.
 - b. Late spring & Early Summer: Field Oats at 25 lbs per acre.
 - c. Fall plantings: Winter Wheat 25 lbs per acre.

2.4 PLUGS

- A. Plugs: wildflowers strongly rooted, and capable of vigorous growth and development when planted; of the following species and plug size:
 - 1. Species: As Indicated in Drawings
 - 2. Plug Size: 2 inches

2.5 SOIL AMENDMENTS

- A. Amend soils as required in "32 91 13- Soil Preparation"

2.6 FERTILIZERS

- 1. Fertilize using commercial fertilizers as necessary based on soil testing results and as required in "32 91 13- Soil Preparation".

2.7 MULCHES

- A. Provide Minnesota Crop Improvement Association (MCIA) certified "weed free" mulch. Each bale must be tagged and tags must be shown to landscape architect prior to spreading.
 - 1. Submit mulch bale tags to the Landscape Architect for record.
- B. Use only MnDOT Type 3 Mulch: air-dry, clean, and mildew and weed-free mulch material suited for seeding cover. Delivered to be kept dry.
 - 1. Straw Mulch: Seed-free, salt hay or threshed straw of wheat, rye, oats, or barley at 2 tons/ acre
 - 2. Native Prairie Straw mulch at 1.5 tons/acre.

2.8 HERBICIDES

- A. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated. EPA registered and approved, of type recommended by manufacturer for application.
 - 1. Acceptable products: Roundup by Monsanto or approved substitute.
 - 2. Provide Aquatic-Safe herbicide when working within 200' of water bodies.

2.9 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: TEMPORARY EROSION CONTROL BLANKET – shall consist of all natural netting and stitching

1. Netting: Fully bio-degradable, All-Natural top and bottom; mechanically stitched; Top net opening 0.5 inch x 1.0 inch; Bottom net opening 0.5 inch x 1.0 inch; LENO or "Cross" weave
 - a. Photodegradable plastic netting not permitted.
2. Matrix: 100% certified weed-free agricultural straw and or straw/coconut blend
 - a. Category 20N:
 - 1) Natural Net EG-1S (NN) as manufactured by Ero-Guard 412 Hwy 22 South, Mapleton, MN. 56065 (612) 382-2783 or, ECS-2B by East Coast Erosion Control 443 Bricker Road, Bernville, PA 19506 1-800-582-4005
 - 2) Excel SR-1 All Natural as manufactured by Western Excelsior
 - b. Category 25N:
 - 1) Natural Net EG-2S (NN) as manufactured by Ero-Guard 412 Hwy 22 South, Mapleton, MN. 56065 (612) 382-2783 or, ECS-2B by East Coast Erosion Control 443 Bricker Road, Bernville, PA 19506 1-800-582-4005
 - 2) Eronet S150BN as manufactured by Tensar North American Green
 - 3) Excel SS-2 All Natural as manufactured by Western Excelsior

2.10 PLANTING SOILS

- A. Provide soils as required in "32 91 13- Soil Preparation"

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
 1. Verify that soil preparation and related preceding work have been completed. Coordinate with the general contractor and/or grading contractor to insure the correct amount of topsoil has been placed and to the finished grade elevations required. Notify the general contractor immediately of deficiencies and have them corrected prior to mobilization of seeding work.
 2. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 4. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation".
- B. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 1. Protect grade stakes set by others until directed to remove them.

- C. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- D. Clear areas to be seeded of existing weeds and grasses by applying herbicide, as per the manufacturer's directions.
 - 1. Provide **two applications** of herbicide, 14-21 days apart.
 - 2. Last application must be applied a minimum of fourteen (14) days before disturbing the vegetation with other procedures. A complete kill (burn-down) of weeds and scrub must be made prior to seed bed preparation.
 - 3. Thoroughly incorporate dead vegetation into soil by disking.
 - a. If viable weed seeds are present, remove and dispose weed material off site.
- E. Re-spread stockpiled topsoil or if quantities are insufficient, imported topsoils to a minimum of 2" depth in areas indicated to receive native seed. Stockpiled soils must be free of existing weeds and grasses or treated as described above.
- F. Holes, depressions and rivulets shall be filled in and brought to a smooth finish grade. Do not plant on land that does not have a properly prepared seed bed in accordance with these specifications.
- G. Remove sticks, branches, stones, debris, or lumps over ¾" diameter which will interfere with the seeding. Methods include hand-raking, mechanical dragging and Harley Power Box Rake.
- H. Scarify, disk, or harrow-till a minimum of the top six inches of topsoil. For heavily compacted soils, multiple passes with tillage equipment may be necessary to achieve an acceptable seed bed, where initial tillage pass creates a clumpy soil condition.
 - 1. Refer to section "32 91 13- Soil Preparation" for soil decompaction requirements.
- I. Harrow or rake the area to be seeded in order to CREATE A FIRM SMOOTH SEED BED in finished grade condition. This operation shall break up root systems and soil clods so that the average clump is less than 2" inch diameter. Remove all rocks greater than 4" and all debris. (If one walks across seed bed areas and leaves footprints greater than ½" in depth, the seed bed needs to be further compacted.)
 - 1. Using a rolling-type packer, pack any areas of tilled, loose, or regarded soil within the zone to be seeded.
- J. Seeding contractor shall coordinate their mobilization with the general contractor and/or landscape contractor to whom they are contracted. Erect fencing and barricades to keep pedestrians & equipment off the seed beds.

3.3 SEEDING

- A. Seed during defined windows of time in spring and fall.
- B. Sow seed with seeding machine/no-till drill or, broadcast type, with an interseeding attachment specially designed for seeding native prairie seed species. Broadcast or no-till drill seed uniformly to an average depth of ¼ inch.
 - 1. Do not broadcast or drop seed when wind velocity exceeds **5 mph**.
 - 2. Apply seed in 1/2 volume per pass by covering the ground and crossing in two directions.
 - 3. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 4. Seeds forbs separately from native grasses.
 - a. Cover crops may be seeded with native grasses if separate hopper is available to control seed rate.
 - 5. Hand Seeding: In areas too cramped for equipment or on very small sites where it is not practical to use large equipment, seed can be broadcast by hand or with a mechanical spreader. Seed application rates vary for each mix – see Products, Section 2. Seed must be covered by hand raking before mulching.
- C. Sow seed at total rate indicated.
- D. Calibration of the seeder shall be done each time the seeder is brought to the site and witnessed by the Architect or Owner's representative.
- E. Immediately after seeding, firm seedbed with a drag or cultipacker.

- F. Protect seeded areas from hot, dry weather or drying winds by applying mulch within 24 hours after completing seeding operations.
- G. Provide temporary irrigation as needed to promote establishment and survivability of plug plantings where rainfall amounts fall below equivalent of 1" per week during growing season. Contractor shall be responsible for providing and operating sprinklers, hoses, hand watering, or other means and methods.

3.4 MULCHING

- A. Protect seeded areas with slopes exceeding 3:1 with erosion-control blankets installed and stapled according to manufacturer's written instructions.
 - 1. For erosion-control blanket, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- B. Straw/Native Prairie Straw Mulch:
 - 1. Apply to seeded areas not exceeding a 3:1 slope at the rate specified per mulch type.
 - 2. Distribute uniformly to obtain coverage of ground surface.
 - 3. Mulch to be dry and free of mold, weeds or other noxious agents.
 - 4. Disk-Anchor mulch in place immediately after placement to prevent blowing away.

3.5 PLUGGING

- A. Plant plugs in holes or furrows, spaced as indicated in drawings. On slopes, contour furrows to near level.
 - 1. For plug material in erosion control, cut small holes in blanket to allow planting.
 - 2. Ensure mulching material does not cover/ suffocate vegetation.

3.6 NATIVE PRAIRIE MAINTENANCE

- A. Maintain and establish native prairie by hand weeding, mowing, trimming, herbicide application, replanting, and performing other operations as required to establish a healthy, viable native prairie. The contractor shall maintain prairie areas for THREE years after the general contract requirements have been completed and accepted.
 - 1. If seeding is completed in spring/ early summer, maintenance requirements shall begin that year. If seeding is performed in fall, maintenance requirement shall begin during the growing season of the following year.

3.7 ESTABLISHMENT PERIOD MAINTENANCE ACTIVITY:

- 1. Maintenance mowing shall be conducted for the **first three growing** seasons after seeding is completed. Mowing shall consist of flail and spot mowing a minimum of three times in the first two growing season to suppress nonnative/non-desirable species from outcompeting native species seedlings and to promote native plant growth. Mow a minimum of two times during the third growing season.
 - a. Mowing shall be conducted in June through September when vegetation reaches a height of 12-14." Mowing shall be timed to prevent seed heads from non-native/non-desirable species from developing.
 - b. Mow to a height of 4-6 inches in the first full growing season and 6-8 inches in the second and third full growing season in order to prevent substantial damage to native species seedlings.
- 2. Herbicide spot spraying shall be conducted to control small populations of non-native/non-desirable species such as Canada thistle, vetch, etc. Herbicide spot spraying shall be conducted minimally to avoid impact to native species seedlings. Additionally, spot spraying shall be conducted in such a manner as to avoid drift to non-target species. All herbicide applications shall be conducted under the supervision of a state licensed pesticide applicator. Applicator shall be a prairie ecologist or individual knowledgeable in the identification

of weeds in contrast to prairie plants. Prairie plants lost due to erroneous weeding/spraying will be replaced by the seed contractor at no additional expense to the Owner

3. Additional maintenance activities:
 - a. Over-seed failed native prairie areas with original seed mixes at ½ the original seeding rates. Mow according to planting / seeding specifications.
 - b. Replant failed natural area forb plantings (wet / mesic prairie, emergent and aquatic plantings) with original species and densities.
 - c. Roll, regrade, and replant bare or eroded areas and remulch. Provide materials and installation the same as those used in the original installation.
 - d. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and native prairie damaged or lost in areas of subsidence.
 - e. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement until vegetation is established.
 - f. Apply treatments as required to keep native prairie and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

3.8 SATISFACTORY NATIVE PRAIRIE

- A. Native Prairie installations shall meet the following criteria as determined by Landscape Architect:
 1. Satisfactory Seeded Native Prairie: At end of maintenance period, a healthy, uniform, close stand of native prairie grass and forbs has been established, free of weeds and surface irregularities, with coverage exceeding 80 percent over any 10 sq. ft.
 2. Seeded areas which fail to show an adequate stand (80% coverage) of native prairie grasses within four weeks shall be raked, re-seeded and re-mulched. Fall seed which fails to show an adequate stand shall be re-graded, re-seeded and re-mulched the following spring prior to June 1.
 3. Reseeding shall continue until an adequate stand of native prairie grasses overall is achieved. Seed loss due to acts of nature shall not be exempt and re-seeding shall be required. The seeding contractor is required under this contract to establish an adequate stand, (80% coverage) and as defined by MnDOT Standard Specifications for Construction, 2018 Edition for acceptable seed germination and must take steps as necessary to achieve that requirement.
 4. Areas of seed loss due to erosion or wash-out shall be re-graded and have erosion control seed blanket staked in-lieu of broadcast seed at no additional expense to the owner.
- B. Use specified materials to reestablish native prairie that does not comply with requirements and continue maintenance until native prairie is satisfactory.

3.9 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- D. Remove nondegradable erosion-control measures after establishment period.

END OF SECTION 329200

SECTION 32 93 00 - PLANTS

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.

1.2 SUMMARY

- A. Section Includes:

- 1. Plants.
- 2. Tree stabilization.
- 3. Tree-watering devices.
- 4. Landscape edgings.

- B. Related Requirements:

- 1. Section 329200 "Turf and Grasses" for turf (lawn).
- 2. Section 024101 "Tree Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: 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 plant required.
- D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than the minimum root spread according to ANSI Z60.1 for type and size of plant required.
- E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. 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 plant required.
- F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted 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 plant.

- G. Finish Grade: Elevation of finished surface of planting soil.
- H. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.
- I. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- J. Planting Area: Areas to be planted.
- K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" for drawing designations for planting soils.
- L. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- M. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots, the area of transition between the root system and the stem or trunk.
- N. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- O. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 COORDINATION

- A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
 - 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
 - 2. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of two photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.
- B. Samples for Verification: For each of the following:

1. Trees and Shrubs: Two physical samples of each variety and size delivered to site for review.
2. Compost Mulch: 1-pint volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
3. Mineral Mulch: 2 lb. of each mineral mulch required, in sealed plastic bags labeled with source of mulch. Sample shall be typical of the lot of material to be delivered and installed on-site; provide an accurate indication of color, texture, and makeup of the material.
4. Weed Control Barrier: 12 by 12 inches.
5. Proprietary Root-Ball-Stabilization Device: One unit.
6. Slow-Release, Tree-Watering Device: One unit of each size required.
7. Edging Materials and Accessories: Manufacturer's standard size, to verify color selected.
8. Tree Grates, Frames, and Accessories: Manufacturer's standard size.
9. Root Barrier: Width of panel by 12 inches.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 1. Manufacturer's certified analysis of standard products.
 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.
- D. Sample Warranty: For special warranty.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.
 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 2. Experience: Five years' experience in landscape installation.
 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 4. Personnel Certifications: Installer's field supervisor shall have certification in all of the following categories from the Professional Landcare Network:
 - a. Landscape Industry Certified Technician - Exterior.
 - b. Landscape Industry Certified Interior.
 - c. Landscape Industry Certified Horticultural Technician.
 5. Pesticide Applicator: State licensed, commercial.

- B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
 - 1. Selection of plants purchased under allowances is made by Architect, who tags plants at their place of growth before they are prepared for transplanting.
- C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
 - 1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
 - 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- D. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
 - 1. Notify Architect of sources of planting materials seven days in advance of delivery to site.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways, and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk materials with appropriate certificates.
- C. Deliver bare-root stock plants within 24 hours of digging. 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. Transport in covered, temperature-controlled vehicles, and keep plants cool and protected from sun and wind at all times.
- D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, 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 plants during shipping and delivery. Do not drop plants during delivery and handling.
- E. Handle planting stock by root ball.
- F. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.
- G. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
 - 1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

- H. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.
- I. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
 - 1. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two hours. Reject plants with dry roots.
 - 2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 3. Do not remove container-grown stock from containers before time of planting.
 - 4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.11 FIELD CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Deciduous B&B and Potted Plants:
 - a. April 15th to June 15th.
 - b. August 21 to November 15th.
 - 2. Coniferous Evergreen B&B:
 - a. April 15 to June 15th.
 - b. August 21 to September 30.
 - 3. Summer plantings may be allowed if site irrigation is included within the project. Obtain landscape architect approval if planting outside of the dates listed above.
- C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.12 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
 - b. Structural failures including plantings falling or blowing over.
 - c. Faulty performance of tree stabilization edgings.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Periods: From date of Substantial Completion.
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
 - 3. Include the following remedial actions as a minimum:

- a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
- b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
- c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable.
 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.
- E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.
- F. Annuals: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

2.2 FERTILIZERS

- A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
 1. Size: As recommended by manufacturer.
 2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.3 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 - 1. Type: Shredded hardwood.
 - 2. Size Range: 2 inches maximum, 1/2 inch minimum.
 - 3. Color: Natural.
- B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through a 1-inch sieve; soluble-salt content of 2 to 5 dS/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- C. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of the following type, size range, and color:
 - 1. Type: As indicated in Drawings on Materials Schedule.

2.4 WEED-CONTROL BARRIERS

- A. Nonwoven Geotextile Filter Fabric (for use in planting areas when indicated on Drawings): Polypropylene or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids.
- B. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz./sq. yd.

2.5 PESTICIDES

- A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.6 TREE-STABILIZATION MATERIALS

- A. Trunk-Stabilization Materials:
 - 1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
 - 2. Wood Deadmen: Timbers measuring 8 inches in diameter and 48 inches long, treated with specified wood pressure-preservative treatment.
 - 3. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles.

4. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch in diameter for large trees / 0.080 inch in diameter for small trees.
5. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
6. Guy Cables: Five-strand, 3/16-inch-diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.
7. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.
8. Proprietary Staking-and-Guying Devices: Proprietary stake or anchor and adjustable tie systems to secure each new planting by plant stem; sized as indicated and according to manufacturer's written recommendations.

B. Root-Ball Stabilization Materials:

1. Upright Stakes and Horizontal Hold-Down: Rough-sawn, sound, new hardwood, or softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated; stakes pointed at one end.
2. Wood Screws: ASME B18.6.1.
3. Proprietary Root-Ball Stabilization Devices: Proprietary at- or below-grade stabilization systems to secure each new planting by root ball and that do not encircle the trunk; sized according to manufacturer's written recommendations unless otherwise indicated.

2.7 LANDSCAPE EDGINGS

A. Steel Edging: Standard commercial-steel edging, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Border Concepts, Inc.
 - b. Collier Metal Specialties, Inc.
 - c. J. D. Russell Company (The).
 - d. Sure-loc Edging Corporation.
2. Edging Size: 3/16-inch-thick by 4 inches deep.
3. Stakes: Tapered steel, a minimum of 12 inches long.
4. Accessories: Standard tapered ends, corners, and splicers.
5. Finish: Manufacturer's standard paint.
 - a. Paint Color: Black.

2.8 TREE-WATERING DEVICES

A. Slow-Release Watering Device: Standard product manufactured for drip irrigation of plants and emptying its water contents over an extended time period; manufactured from UV-light-stabilized nylon-reinforced polyethylene sheet, PVC, or HDPE plastic.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BIO-PLEX.
 - b. Engineered Watering Solutions; PQ Partners, LLC.
 - c. Spectrum Products, Inc.
2. Color: green.

2.9 MISCELLANEOUS PRODUCTS

- A. Root Barrier: Black, molded, modular panels 18 inches high (deep), 85 mils thick, and with vertical root deflecting ribs protruding 3/4 inch out from panel surface; manufactured with minimum 50 percent recycled polyethylene plastic with UV inhibitors.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DeepRoot Green Infrastructure, LLC.
 - b. NDS Inc.
 - c. Villa Root Barrier.
- B. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
- C. Burlap: Non-synthetic, biodegradable.
- D. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.
- E. Planter Filter Fabric: Nonwoven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.
- F. Filter Fabric at non-planting and drainage areas: Woven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.
- G. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb. of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb. of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
 - 3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable, or which is dusty.
- B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Lay out plants at locations directed by Landscape Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

3.3 PLANTING AREA ESTABLISHMENT

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."
- B. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- C. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at application rate according to manufacturer's written recommendations.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Percolation Test: One test location per 20 trees. Prior to testing, submit site plan with proposed test locations marked for approval by Landscape Architect. Additional tests may be needed as required by Landscape Architect. Mark testing locations with visible stake.
 - a. Fill planting hole with water and allow it to drain completely.
 - b. Hardpan Layer: Drill 6-inch diameter holes, 24 inches apart, into Hardpan Layer
 - c. Fill planting hole with water again and immediately measure the depth of the water in the pit with a ruler. Record the time.
 - d. After 15 minutes have passed, measure the depth of the water in the pit again.
 - e. Multiply the number of inches that have drained by 4 to get drainage in inches per hour.
 - f. Drainage will fall into one of three categories:
 - 1. Poorly drained = less than 2" per hour
 - 2. Well drained = 3" to 6" per hour
 - 3. Excessively drained = more than 6" per hour
 - g. Prepare written test results and submit to Landscape Architect. If soils are poorly drained, immediately notify Landscape Architect of this condition. Upon direction, contractor shall complete soil decompaction procedure per of this Section, and/or install 6" perforated pvc drain tile encased in granular material, wrapped in geotextile and connect to nearest storm sewer line.
- B. Planting Pits and Trenches: Excavate circular planting pits.
 - 1. Excavate planting pits according to planting details and with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
 - 2. Excavate approximately three times as wide as ball diameter for balled and burlapped stock.

3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
 4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 7. Maintain supervision of excavations during working hours.
 8. Keep excavations covered or otherwise protected after working hours.
 9. If drain tile is indicated on Drawings or required under planting areas, excavate to top of porous backfill over tile.
- C. Backfill Soil: Subsoil and topsoil removed from excavations may be used as backfill soil unless otherwise indicated.
- D. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
1. Hardpan Layer: Drill 6-inch-diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.
- E. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- F. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

- A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
1. Backfill: Planting soil.
 2. After placing some backfill around root ball to stabilize plant, carefully cut, and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 - a. Quantity: Per manufacturer recommendations.
 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Balled and Potted and Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
1. Backfill: Planting soil.

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2. Carefully remove root ball from container without damaging root ball or plant.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 - a. Quantity: Per manufacturer's recommendations.
 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. Bare-Root Stock: Set and support each plant in center of planting pit or trench with root flare 1 inch above adjacent finish grade.
1. Backfill: Planting soil.
 2. Spread roots without tangling or turning toward surface. Plumb before backfilling and maintain plumb while working.
 3. Carefully work backfill in layers around roots by hand. Bring roots into close contact with the soil.
 4. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 5. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside soil-covered roots about 1 inch from root tips; do not place tablets in bottom of the hole or touching the roots.
 - a. Quantity: Per manufacturer recommendations.
 6. Continue backfilling process. Water again after placing and tamping final layer of soil.
- F. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.
- 3.6 TREE, SHRUB, AND VINE PRUNING
- A. Remove only dead, dying, or broken branches. Do not prune for shape.
 - B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.
 - C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
 - D. Do not apply pruning paint to wounds.
- 3.7 TREE STABILIZATION
- A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:
 1. Upright Staking and Tying: Stake trees of 3-inch through 5-inch caliper. Stake trees of less than 3-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend at least 72 inches above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
 2. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

3. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
- B. Trunk Stabilization by Staking and Guying: Install trunk stabilization as follows unless otherwise indicated on Drawings. Stake and guy trees more than 14 feet in height and more than 3 inches in caliper unless otherwise indicated.
 1. Site-Fabricated, Staking-and-Guying Method: Install no fewer than three guys spaced equally around tree.
 - a. Securely attach guys to stakes 30 inches long, driven to grade. Adjust spacing to avoid penetrating root balls or root masses. Provide turnbuckle for each guy wire and tighten securely.
 - b. For trees more than 6 inches in caliper, anchor guys to wood deadmen buried at least 36 inches below grade. Provide turnbuckle for each guy wire and tighten securely.
 - c. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
 - d. Support trees with guy cable or multiple strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
 - e. Attach flags to each guy wire, 30 inches above finish grade.
 - f. Paint turnbuckles with luminescent white paint.
 2. Proprietary Staking and Guying Device: Install staking and guying system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.
- C. Root-Ball Stabilization: Install at- or below-grade stabilization system to secure new planting on slopes by the root ball as directed by Landscape Architect where trunk stabilization is infeasible or insufficient.
 1. Wood Hold-Down Method: Place vertical stakes against side of root ball and drive them into subsoil; place horizontal wood hold-down stake across top of root ball and screw at each end to one of the vertical stakes.
 - a. Install stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation. Saw stakes off at horizontal stake.
 - b. Install screws through horizontal hold-down and penetrating at least 1 inch into stakes. Predrill holes if necessary to prevent splitting wood.
 - c. Install second set of stakes on other side of root trunk for larger trees.
 2. Proprietary Root-Ball Stabilization Device: Install root-ball stabilization system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

3.8 ROOT-BARRIER INSTALLATION

- A. Install root barrier where trees are planted within 60 inches of paving or other hardscape elements, such as walls, curbs, and walkways, unless otherwise indicated on Drawings.
- B. Align root barrier vertically and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.
- C. Install root barrier continuously for a distance of 60 inches in each direction from the tree trunk, for a total distance of 10 feet per tree. If trees are spaced closer, use a single continuous piece of root barrier.
 1. Position top of root barrier according to manufacturer's written recommendations.
 2. Overlap root barrier a minimum of 12 inches at joints.
 3. Do not distort or bend root barrier during construction activities.
 4. Do not install root barrier surrounding the root ball of tree.

3.9 PLACING SOIL IN PLANTERS

- A. Place a layer of drainage gravel at least 4 inches thick in bottom of planter. Cover bottom with filter fabric and wrap filter fabric 6 inches up on all sides. Duct tape along the entire top edge of the filter fabric, to secure the filter fabric against the sides during the soil-filling process.
- B. Fill planter with planting soil. Place soil in lightly compacted layers to an elevation of 1-1/2 inches below top of planter, allowing natural settlement.

3.10 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- E. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- F. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.11 PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1. Trees in Turf Areas: Apply organic mulch ring of 3-inch average thickness, with 36-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.
 - 2. Organic Mulch in Planting Areas: Apply 2-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

3.12 EDGING INSTALLATION

- A. Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches apart, driven below top elevation of edging.

3.13 INSTALLING SLOW-RELEASE WATERING DEVICE

- A. Provide one device for each tree in areas without permanent irrigation.
- B. Place device on top of the mulch at base of tree stem and fill with water according to manufacturer's written instructions.

3.14 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting, and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.15 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.16 REPAIR AND REPLACEMENT

- A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.
 - 1. Submit details of proposed pruning and repairs.
 - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.
- B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition or are damaged during construction operations that Landscape Architect determines are incapable of restoring to normal growth pattern.
 - 1. Provide new trees, shrubs, or perennials of same size as those being replaced.
 - 2. Species of Replacement Trees: Species selected by Architect.

3.17 CLEANING AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.
- C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

- D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.
- E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.18 MAINTENANCE

- A. Maintenance Service for Trees, Shrubs and Perennials: Provide maintenance by skilled employees of landscape Installer. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:
 - 1. Maintenance Period: 12 months from date of Substantial Completion.

END OF SECTION 32 93 00

SECTION 33 01 30.86 - MANHOLE RIM ADJUSTMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to adjusting a casting assembly frame and ring or valve box as indicated on the drawings or as specified herein.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. Measurement and compensation for adjusting existing manhole and catch basin frame and ring castings shall be included in the LUMP SUM price bid for the project or bidding section.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances will not be individually paid. The costs will be included in the LUMP SUM price bid. Such items of work include but are not limited to:
 - 1. Saw cutting the wall of the existing structure, if necessary.
 - 2. Removing and replacing existing concrete or HDPE adjusting rings, if necessary.
 - 3. Adjusting chimney seals on existing structures, if necessary.
 - 4. Chimney seals shall be installed from the top of the concrete structure to the middle of the casting. The chimney seal(s) shall cover all joints.

1.3 SPECIFICATION REFERENCES

- A. MnDOT 2506 shall apply to adjusting frame and ring, except as modified herein.
- B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.4 SUBMITTALS

- A. No submittals for this section.

PART 2 - PRODUCTS

2.1 ADJUSTING RINGS

- A. Only concrete adjusting rings will be permitted.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. The Contractor shall bring manhole castings and valve boxes to grade. The manhole casting shall be placed on a full mortar bed or bituminous mastic upon final setting. When adjusting rings are used, they shall be set with cement mortar and shall be plastered inside and out, with a minimum thickness of ½-inch of mortar. Maximum adjustment allowed between the top cone/slab section and bottom casting is 12.0-inches. A maximum of 3 individual adjusting rings shall be used. Taller 6.0-inch or 12.0-inch rings shall be used where adjustment requires more than 3 (2.0-inch) rings. Place chimney seal as required.
- B. All inverts of manholes and valves boxes shall be cleaned of debris and gravel which may have fallen into the structures as a result of construction.
- C. Finished grade of the casting or valve box in paved areas shall be according to the following, unless otherwise specified on the plans:

	Distance Below Adjacent Concrete Pavement (in)	Distance Below Adjacent Bituminous Pavement (in)	Distance Below Adjacent Gravel Surface/Green Area (in)
City Streets	1/8 to ¼	¼ to 3/8	1

	Distance Below Adjacent Concrete Pavement (in)	Distance Below Adjacent Bituminous Pavement (in)	Distance Below Adjacent Gravel Surface/Green Area (in)
Sidewalks	1/8 to ¼	1/8 to ¼	1
Parking Areas	1/8 to ¼	¼ to 3/8	1

- D. In no case shall the casting or valve box extend above the finished surface.
- E. Raising and/or lowering an existing manhole to meet a proposed finished rim elevation is performed when the addition and/or deletion of 2.0-inch adjusting rings will not reach a minimum of 2 rings or exceed a maximum of 6 rings. Typically, it will require the:
 - 1. Removal of the manhole cone section or concrete slab top
 - 2. Addition, removal or exchange of barrel sections
 - 3. Replacement of the cone section or the flat slab top
 - 4. Installation of the proper number of adjusting rings
 - 5. Replacement of the manhole frame and casting.
 - 6. In some cases, the existing structure may require saw cutting.
- F. Raise/Lower Existing Manhole
 - 1. Furnishing and installing chimney seals and/or chimney seal extensions adequate to provide complete coverage of all joints between the top of the concrete structure and the middle of the casting.

END OF SECTION

SECTION 33 05 06 - TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to maintenance of utility service, trench excavation, bedding and backfill necessary for the construction of underground utilities and structures, as indicated on the drawings or as specified herein.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. Measurement and compensation for trenching and backfilling shall be included in the LUMP SUM price bid for the project or bidding section.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances will not be individually paid. The costs will be included in the LUMP SUM price bid. Such items of work include but are not limited to:
 - 1. Interference with other above and underground structures and utilities.
 - a. The removal and restoration, or protection of existing structures and utilities which are shown on the plans.
 - 2. Any dewatering necessary for construction.
 - 3. Foundation materials placed in lieu of performing necessary dewatering.
 - 4. Bulkheading of existing pipes to be abandoned in place.
 - 5. Granular bedding and encasement and foundation materials.
 - 6. Crushed rock foundation materials used in lieu of bedding materials in the specified bedding zone.
 - 7. The removal and disposal of unsuitable native materials for bedding and/or backfill.
 - 8. Providing and maintaining service.
 - 9. The replacement of all material displaced due to shrinkage or loss during the excavation and backfilling operations.
 - 10. Compaction and compaction testing.
 - 11. Delays due to other utility conflicts which result during the course of construction.
 - 12. Protecting existing improvements and previously accepted elements of this construction from damage.
 - 13. Protecting the inverts of other utility pipes from the accumulation of debris and soil, the removal of blockages which threatens to damage property, and/or the cleaning of both the newly constructed lines and the existing lines of all debris and soil which accumulated during the construction.
 - 14. Rock excavation, if required.

1.3 SPECIFICATION REFERENCES

- A. Reference CEAM 2600 shall apply to excavating, installing bedding and backfilling all trench excavation construction necessary for the completion of work, except as modified herein.
 - 1. All references to Mn/DOT specifications shall mean the specific edition, including Supplemental Specifications and Technical Memoranda as identified in Section 01 42 19 "Reference Standards" of this Project Manual.
 - 2. CEAM 2600 Maintenance of Traffic is hereby deleted, See Section 01 55 26 "Traffic Control" of this Project Manual.
 - 3. CEAM 2600 Establishing Line and Grade is modified by Section 01 71 23 "Field Engineering" of this Project Manual.
 - 4. CEAM 2600 Protection of Surface Structures:
 - a. Street signs shall be considered as items of essential service.

- b. The last sentence in the third paragraph is deleted.
 - 5. CEAM 2600 Removal of Surface Improvements - All rubble and debris to be disposed of off-site, shall be disposed of at a location secured by the Contractor and in a manner in compliance with applicable Local, State and Federal regulations.
 - 6. CEAM 2600 Excavation Limits and Requirements - OSHA limitations shall also apply to the top of trench width determination. The seven-day written notice is waived if changing soil conditions and OSHA compliance apply.
 - 7. CEAM 2600 Jacking/Boring - The Contractor is responsible for protecting all existing utilities above the elevation of the pipe invert minus 2 times the wall thickness of the casing pipe being installed. In addition, bentonite materials shall not be permitted to flow back into the excavation during the non-open cut construction.
 - 8. CEAM 2600 Pavement Restoration is hereby deleted, See applicable sections of these Specifications.
 - 9. CEAM 2600 Method of Measurement Paragraphs B and C are hereby deleted. See applicable sections of these Specifications.
 - B. Reference MnDOT 2451 shall apply to granular materials for foundation, bedding and encasement of utility line construction, except as modified herein.
 - C. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.
- 1.4 SUBMITTALS
- A. Gradation Test Results for any granular borrow materials.
 - B. 2 separate tests, as required in Source Quality Control provisions of individual sections contained herein, from material stockpiles of aggregates to be used on this project. These tests may be run by the Contractor or its supplier during aggregate production.

PART 2 - PRODUCTS

- 2.1 GRANULAR MATERIALS
- A. Granular Backfill - No exception to the referenced specification is made.
 - B. Granular Bedding and Granular Encasement - Bedding and granular encasement materials used in the pipe zone area (6.0-inch below the pipe to 12.0-inch over the pipe) shall meet the same gradation and specification as granular backfill, above.
 - C. Granular Backfill - Granular backfill material to be used above the pipe zone up to the top of subgrade if unsuitable native material is encountered shall conform to MNDOT 3138, Class 3, modified to permit the following gradation limits. The use of the material shall be reviewed by the Architect prior to the installation of the material.

Sieve Size	Percent Passing
1½-inch	100
# 4	35 - 100
# 10	20 - 80
# 40	5 - 40
# 200	0 - 15

PART 3 - EXECUTION

- 3.1 CONSTRUCTION REQUIREMENTS
- A. Temporary Service
 - 1. Before proceeding with the project, the Contractor shall establish a work plan and submit the plan to the utility personnel and Owner for review and comment. The plan shall outline the method to be used to maintain service to the affected consumers and estimate the duration of any anticipated interruptions of service. The Contractor is the sole party responsible to notify the Utility and consumers who may be affected by limitations and/or interruption of water service. Planned service interruptions shall not exceed 6 hours in any 72-hour period unless previously approved by the Utility.
 - 2. The Contractor shall schedule water main shut-downs with the water utility and notify affected residents/users at least 24 hours but no more than 48 hours prior to the requested shut-down period. The water utility shall operate all valves.

No valves shall be operated by the Contractor without the expressed written authority of the water utility. Prior to the water utility shutting down a portion of the water distribution system, the Contractor shall have performed subsurface exploration to determine the size, depth and location of the existing water main.

3. The Contractor shall furnish, install and maintain equipment to bypass and control the storm and/or sanitary sewer flow around the construction zone. Failure to operate and maintain the bypass equipment could result indirect damage claims as well as consequential damage claims to the Contractor.

3.2 EXCAVATION AND PREPARATION OF TRENCH

A. Interference and Protection of Underground Structures

1. The Contractor shall be required to remove and restore, or protect existing utilities as shown on the plans.
2. The inverts of existing sewers (storm & sanitary), culverts, subdrains, etc. shall be protected during construction. The Contractor is responsible to inspect and clean, if necessary, all lines which have become compromised by the construction operations.

B. Excavation Limits and Requirements

1. The Contractor shall install and operate a dewatering system to maintain all trenches free of water. The Contractor shall make its own subsurface investigations to determine the extent of the dewatering and the dewatering methods to be utilized.
2. The Contractor shall be responsible for any damage to adjacent structures or buildings caused by the dewatering operations
3. Use of granular foundation material in lieu of performing dewatering is permitted, at the Contractor's expense.
4. All unsuitable excess excavated material shall become the property of the Contractor and shall be removed from the site and disposed of at a site secured by the Contractor.
5. The trench for all flexible pipe shall be undercut 6-inches below the pipe barrel to permit the installation of granular bedding or foundation material.

C. Preparation and Maintenance of Foundation

1. Flexible Pipe Materials

- a. Unless otherwise shown on the plans, in ordinary trench conditions, the pipe shall be bedded in compacted granular bedding which extends from 6-inches below the bottom of the pipe to the spring line of the pipe. The Contractor shall bed and encase the pipe in bedding and encasement material, as specified and compacted to 95 percent Standard Proctor Density or as recommended by the pipe manufacturer, whichever is denser.
- b. Where the trench foundation has been found to be unstable and not suitable for bedding, the Contractor shall install compacted granular foundation material from 6.0-inches below the bottom of the pipe to the bottom of the pipe. Granular bedding material shall then be placed to the spring line of the pipe.

2. Rigid Pipe Materials

- a. Where the trench foundation has been found to be unstable and not suitable for bedding, the trench shall be undercut until acceptable conditions are found. The Contractor shall then install compacted foundation material to meet the line and grade specified on the plan.

3.3 INSTALLATION OF PIPE AND FITTINGS

- A. The Contractor shall keep accurate records as to the location of the service connections, field tile, utility crossings, etc., either constructed or encountered during the construction. Measurements to service lines shall be taken from the two nearest permanent structures (i.e., hydrants, valves, manholes, buildings). Final payment for the project will not be made until the information is in the possession of the Owner.
- B. When connection to an existing conduit is required at an existing or proposed manhole, the Contractor shall expose and verify the elevation of the existing conduit prior to laying any pipe toward, or away from, the connection point. If the elevation of the existing conduit does not match the elevation shown on the plans, the Contractor shall notify the Architect, at which time the Architect may adjust the proposed grades.

C. Sewer Pipe at Structures

1. The pipe end(s) shall be extended inside the structure a maximum of 3.0-inches unless approved otherwise by the Architect or shown on the plans.

D. Connection and Assembly of Joints

1. For sanitary sewer and water lines, all joints shall be watertight.
2. For storm sewers and subdrains, all joints shall be gasketed.

E. Bulkheading Open Pipe Ends

1. The Contractor shall furnish, install and maintain a temporary, water-tight plug adequately blocked in place to prevent flooding of the existing downstream sewer system. The plug shall be placed at the beginning of the project or at the end of each working day at the end of the day's operation.
2. When flows are diverted from an existing sewer or tile to be abandoned in place, the Contractor shall construct a water-tight plug on the open end of the abandoned pipe.
3. Permanent watertight plugs shall be constructed with an approved concrete grout with a thickness of not less than 1 pipe diameter.

3.4 BACKFILLING OPERATIONS

- A. Backfill material around all manholes, catch basins, valve boxes, curb boxes, and hydrants shall be compacted with hand machines. The maximum lift thickness shall be 6.0-inches.

B. Flexible Pipe Materials

1. Granular material shall be furnished, placed and compacted to bed and encase the pipe to an elevation 12.0-inches above the pipe bell the full width of the trench. If the depth of cover becomes critical according to manufacturer's recommendations, the Contractor shall bed and encase the pipe in bedding and encasement material, as specified and compacted to 90 percent Standard Proctor Density or as recommended by the pipe manufacturer, whichever is denser.

- C. All trench backfill shall be compacted in accordance with the Quality Compaction Method.

3.5 SOURCE QUALITY CONTROL

- A. The Contractor shall arrange for having the following testing performed:

1. One gradation test per each 500 tons or 275 cubic yards (CV) of granular materials.

3.6 FIELD QUALITY CONTROL

- A. No exception to the referenced Specification is made.

END OF SECTION

SECTION 33 14 00 – WATER UTILITY TRANSMISSION AND DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to watermain and service line construction as indicated on the drawings or as specified herein.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for water utility transmission and distribution improvements shall be included in the LUMP SUM price bid for the project or bidding section.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances will not be individually paid. The costs will be included in the LUMP SUM price bid. Such items of work include but are not limited to:
 - 1. Furnishing and installing electrical connections to intersecting water mains, include in the lump sum price bid.
 - 2. Concrete blocking or metal ties include in the lump sum price bid.
 - 3. Valve umbrella anchorage assembly include in the lump sum price bid.
 - 4. Locating and connecting to an existing water main or a hydrant, include in the lump sum price bid.
 - 5. Subsurface exploration for determination of the location, elevation, material type and diameter of the existing water mains and service lines.
 - 6. Locating and connecting to an existing water service line, include in the lump sum price bid.
 - 7. Providing and maintaining continuous service, include in the lump sum price bid.
 - 8. Compaction, hydrostatic, leakage, disinfecting coliform bacteria and continuity testing, include in lump sum price bid.
 - 9. Furnishing and installing thrust block, tie rods, joint restraints and sacrificial zinc anode caps as shown on the plans and as specified.
 - 10. Valve operating nut extension rod(s) include in the lump sum price bid.
 - 11. Temporary water service, providing continuous temporary water service to affected users, include in lump sum price bid.
 - 12. The painting or re-painting of hydrants with scratches and/or abrasions, include in the lump sum price bid.
 - 13. The cost of water and City labor necessary to flush and re-test watermains that have failed the initial coliform bacteria test.
 - 14. Providing temporary corporations, copper pipe, plugs, etc. for hydrostatic watermain testing.
 - 15. An A-32 Ford water cover when the curb stop is located in a concrete or bituminous surface.
 - 16. The cost of delivering the water sample to the approved testing laboratory.

1.3 SPECIFICATION REFERENCES

- A. Reference the following sections of this Project Manual as appropriate:
 - 1. Section 33 05 07 "Trenchless Installation of Utility Piping".
 - 2. Section 33 05 06 "Trenching and Backfilling".
- B. CEAM 2611 shall apply, except as modified herein.
- C. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.4 SUBMITTALS

- A. Work plan for temporary service.
- B. Water Service Pipes, Fittings, and Appurtenances
- C. Backflow Prevention Valve (Including Plumbing Configuration)

- D. Blow Off Valve & Quick Connection
- E. Record Drawings
 - 1. The Contractor shall maintain at the construction site one complete set of drawings suitably marked to show all deviations from the original set of drawings and other information as specified.
 - 2. The complete set of the record drawings shall be submitted to the Architect prior to submittal of the final Application for Payment.

PART 2 - PRODUCTS

2.1 OPEN CUT WATERMAIN MATERIAL

- A. The following water pipe materials will be allowed for use on this project:
 - 1. Ductile Iron Pipe, Class 52 with conductivity strips will be used.

2.2 WATERMAIN FITTING MATERIALS

- A. The following pressure pipe fitting materials will be allowed for use on this project:
 - 1. Mechanical joint cast iron or Class 350 ductile iron fittings will be used. The fittings will be manufactured in the U. S. A. The country of origin must be cast into the fitting. U. S. A. manufacturers include but are not limited to Tyler, American Cast Iron, Clow, U. S. Pipe & Foundry, and Griffin. The manufactured in the U. S. A. requirement will not eliminate the fitting performance/compliance specifications.
 - 2. All fittings, valves, hydrants, and restraining rods will be protected by using sacrificial zinc anode caps, ASTM B418 6 oz. Large Zinc Anode Caps as manufactured by Trumbull Industries Inc., or an approved equal. Contractors shall supply 2 anode caps per mechanical joint gland installed.
 - 3. All fittings, valves, hydrants, etc., will be secured utilizing COR-BLUE T-BOLTS as manufactured by NSS Industries or approved equal.
 - 4. Quality control of all fitting manufacturers will conform to the requirements of the International Organization for Standardization (ISO).

2.3 FIRE HYDRANTS

- A. Hydrants will be Waterous "Pacer" with threads currently in use by the Owner. They will be for a cover depth of 7.0-feet 6.0-inches (8.0-feet bury depth) unless otherwise noted on the plans. The break-off height will be 16.0-inches. The Contractor shall install all hydrants so that the center of the nozzle is 24.0-inches above the finished grade.
- B. Hydrants will open 'left' and include 40524 pumper nozzle threads and 7532 hose threads.
- C. All hydrants will have been manufactured in the year of construction or prior two calendar years. If before finalizing the project, it is determined that an installed hydrant does not have a new appearance, it will be painted by brush with a manufacturer's paint.
- D. Hydrant Marker
 - 1. Hydrant markers shall be aluminum E-Z Guide #AL-21.

2.4 VALVE AND VALVE HOUSING

- A. All water valves will have been manufactured in the year of construction or prior two calendar years.
- B. All nuts and bolts will be 304 stainless steel.
- C. Valve Housing
 - 1. Cast-iron screw-type valve boxes and covers will be installed where indicated on underground valves. The cast-iron valve boxes will be of either the two-piece or three-piece style and will be furnished with a stay-put cover with raised letters indicating "WATER." The shaft will be 5 ¼-inch inside diameter. Both the valve box and cover will be manufactured in the U.S.A.
 - 2. All valve box assemblies will be furnished with a valve umbrella anchorage assembly. The valve umbrella anchorage will be manufactured by Adaptor, Inc., Oak Creek, WI, or equal.

3. Gate valves placed where the cover is more than 7.0-feet will require an operating nut extension rod to maintain 6.0-feet between the operating nut and the finished surface. The extension rod will be made of steel.

D. Gate Valves

1. All valves up to and including 12.0-inch diameter to be furnished and installed on the watermain will be AWWA C-509 or AWWA C-515, non-rising stem, iron body, resilient-seated gate valves, with a 2.0-inch square opening nut rated for a 200 psi working pressure. These valves will be American Flow Control or approved equal. All valves will open 'left'.

2.5 WATER SERVICE PIPE AND FITTINGS

A. Service Pipe and Fittings

1. Water service pipe and fittings shall conform to the provisions of CEAM 2611 and the following:

a. The water service materials shall conform to AWWA C800. Acceptable materials are:

	FORD	AY MCDONALD	FORD	AY MCDONALD	FORD	AY MCDONALD
ITEM	1.0-inch	1.0-inch	1.5-inch	1.5-inch	2.0-inch	2.0-inch
Corp Stop	FB 1000-4-Q	74701BQ 1	FB 1000-6-Q	74701BQ 1-1/2	FB 1000-7-Q	74701BQ 2
Corporation Tapping Saddle	N/A	N/A	F-202-(**)-CC6	4825A (**) x 1-1/2	F-202-(**)-CC7	4825A (**) x 2
Curb Stop (1) (2)	B44-444M-Q	76104Q 1	B44-666M-Q	76104Q 1-1/2	B44-777M-Q	76104Q 2
Curb Stop Box	EM2-80-56-72R	5614A 8	EM2-80-57-72R	5615A 8	EM2-80-57-72R	5615A 8
Copper Service Couplings	C44-44-Q	74758Q 1	C44-66-Q	74758Q 1-1/2	C44-77-Q	74758Q 2
Mainline Corporation Repair Saddle	FS1-(**)-CC4	435-(**)-12-A4TLP	FS1-(**)-CC6	435-(**)-12-A6TLP	FS1-(**)-CC7	435-(**)-12-A7TLP

Notes:

- (**) Varies depending on the main line watermain O.D.
- (1) Curb stop box lids shall be furnished with open channel slot style lid, pentagon bolt, and lettered "WATER"
- (2) Curb boxes shall be provided with stationary rod

2. Copper pipe shall conform to ASTM B88, Seamless Copper Water Tubing, Type K, Soft Annealed Copper.
3. Curb boxes shall be eight feet long at full extension and shall be adjusted as required to match finished grade. Curb boxes shall be provided with a stationary rod.
4. All copper fittings shall be compression type.
5. Saddles shall be provided for all corporation stops larger than 1½-inches.
6. A Ford FS1- (**number dependent upon pipe OD**)-N, or AY McDonald 425- (**number dependent upon pipe OD**)-12TLP, Stainless Steel Repair Clamp shall be used on mains to seal holes resulting from service abandonment and corporation removal.
7. AY McDonald NL Service Fitting – 74760Q shall be used for 1" water service connections to the existing 2" copper water service pipe.

2.6 JOINT RESTRAINTS

- A. Joint restraint mechanisms shall be Megalug or approved equal.

PART 3 - EXECUTION

3.1 TEMPORARY SERVICE

- A. Before proceeding with the project, the Contractor shall establish a work plan and submit the plan to the utility personnel and Architect for review and comment. The plan shall outline the method to be used to maintain service to the affected

consumers and estimate the duration of any anticipated interruptions of service. The plan shall include provisions to fully disinfect all temporary piping, valves, and fittings in accordance with CEAM 2611. The Contractor is the sole party responsible to notify the Utility and consumers who may be affected by limitations and/or interruption of water service. Planned service interruptions shall not exceed 6 hours in any 72 hour period unless previously approved by the Utility.

- B. The Contractor shall schedule watermain shutdowns with the water utility and notify affected residents/users at least 24 hours prior to the requested shutdown period. The water utility shall operate all valves. Valves shall not be operated by the Contractor without the expressed, written authority of the water utility. Prior to the water utility shutting down a portion of the water distribution system, the Contractor shall have performed subsurface exploration to determine the size, depth, and location of the existing watermain.

3.2 INSTALLATION OF PIPE AND FITTINGS

A. Aligning and Fitting of Pipes

- 1. The Contractor, together with the Owner’s personnel, shall jointly observe and operate all curb stops and mainline valves prior to final acceptance.
- 2. A watertight cap must be installed by the Contractor at the end of work, each day. Any pipe left open will require flushing and re-chlorination at the Contractor’s expense.

B. Blocking and Anchoring of Pipe

- 1. **A thrust block of cast-in-place concrete, which covers the installed fitting, is not permitted.** Restrained joint retainer glands shall be provided at all bends, tees, hydrants, valves and plugged crosses or wherever the water main changes direction or dead ends.

C. Polystyrene Insulation

- 1. The Contractor shall install polystyrene insulation in those areas where the water main or services may be susceptible to frost or freezing, or as directed by the Architect.

D. Water Service Installation

- 1. Corporation stops, curb stops, and related fitting shall be cast brass with compression fittings.
- 2. The Contractor shall imprint a “W” on the concrete face of curb at the location of the water services in accordance with City standards.
- 3. No warranty is expressed or implied as to the location, size, or material type of existing service lines. The Contractor shall furnish and install all fittings required to make the connections.
- 4. The Contractor shall keep accurate records of hydrants, valves, curb stops, corporation stops, fittings, offsets, services, mainline and connection to existing pipe and stub outs, as constructed. Measurements to service line shall be taken from the two nearest permanent structures (IE. hydrants, valves, manholes, buildings). Final payment for the project will not be made until the information is in the possession of the Owner.
- 5. Fitting connections for 1-inch diameter copper water service shall be compression type. Fitting connections for copper water services larger than 1.0-inch shall be the compression type.
- 6. The Contractor shall furnish and install an A-32 Ford water cover when the curb stop is located in a concrete or bituminous surface.
- 7. When ball corporations are installed, the Contractor shall use the manufacturer recommended open-end wrench for tightening. Any ball corporation not installed in accordance with the manufacturer’s recommendations will require replacement at the Contractor’s expense.
- 8. The water services shall be hydrostatically tested and disinfected.

E. Polyethylene Encasement

- 1. No polyethylene encasement for the main or appurtenances is required unless identified on the plans.

3.3 FIELD QUALITY CONTROL

A. Electrical Conductivity Test

- B. See the referenced CEAM 2611.

- C. Hydrostatic tests shall be conducted in accordance with the referenced specification. Individual tests from valve to valve are required. These tests shall be conducted prior to the bacteriological tests required with the disinfection of the main. No drop in pressure will be allowed during the last two hours of the pressure test.
- D. Water services, including corporation and curb stops, shall be tested. The Contractor may choose to include services at the time of watermain testing or as a separate operation at a reduced pressure of 100 psig. If performed separately, testing shall be done with the corporation stops open.
- E. The Contractor shall disinfect the water main and perform electrical conductivity testing, coliform bacteria testing and hydrostatic testing, as specified in CEAM. After performing and passing hydrostatic test results, final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main. At least one set of samples shall be collected from every 1,200.0-feet of the new watermain, plus one set from the end of the line and at least one set from each branch. All samples shall be tested for bacteriological (chemical and physical) quality in accordance with *Standard Methods for the Examination of Water and Wastewater*; and shall show the absence of coliform organisms; and, if required, the presence of a chlorine residual.
- F. The City of Saint Peter will perform the coliform bacteria test and bill the Contractor for this work. The Contractor is required to deliver the water sample to an approved testing laboratory.
- G. All chlorine used to disinfect watermain(s) must be NSF approved and used at the dosage recommended by AWWA standards. **Calcium hypochlorite intended for swimming pool or spa disinfection does NOT meet this specification.**

AWWA Chlorine Dosage Requirement per Length of Pipe Section (ft)			
Pipe Diameter (inch)	13.0-foot or less	18.0-feet	20.0-feet
	Number of 5-g Calcium Hypochlorite Tablets		
8	1	2	2
10	2	3	3
12	3	4	4

- H. All copper water services, including corporation stop, curb stops, coupling connections or related connections, must be visually inspected by Owner prior to backfilling. Ductile iron pipe water services shall be tested by the hydrostatic method at the same time as the mainline watermain. Contractor shall coordinate; provide access and ample time for Owner to perform visual inspection.

3.4 HYDROSTATIC TESTING

- A. Hydrostatic tests shall be conducted in accordance with the referenced specification. Individual tests from valve to valve are required. These tests shall be conducted prior to the bacteriological tests required with the disinfection of the main. Watermain pressure testing requirements shall be in accordance with the referenced CEAM specification.

3.5 DISINFECTION

- A. The Contractor shall disinfect and perform bacteriological testing on all temporary and permanent water distribution systems in accordance with the provisions of AWWA C-651.
- B. Testing options A and B as described in AWWA C-651 and below shall be required for the bacteriological testing for total coliform analysis.

Option A: Before approving a main for release, take an initial set of samples after flushing and then resample again after a minimum of 16 hours using the sampling site procedures outlined. Both sets of samples must pass for the main to be approved for release.

Option B: Before approving a main for release, flush the main and let it sit for a minimum of 16 hours without any water use. Then collect, using the sampling site procedures outlined and without flushing the main, two sets of samples a minimum of 15 minutes apart while the sampling taps are left running. Both sets of samples must pass for the main to be approved for release.

- C. If the initial disinfection fails to produce satisfactory bacteriological results, or if other results indicate unacceptable water quality, the main may be re-flushed and shall be resampled. If check samples fail to produce acceptable results, the main shall be re-chlorinated by the continuous-feed or slug method until satisfactory results are obtained.
- D. No lines shall be placed in service until a satisfactory result is obtained.

END OF SECTION

SECTION 33 41 00 - SUBDRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary to construct subsurface drains as indicated on the drawings or as specified herein.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. Measurement and compensation for subdrainage improvements shall be included in the LUMP SUM price bid for the project or bidding section.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances will not be individually paid. The costs will be included in the LUMP SUM price bid. Such items of work include but are not limited to:
 - 1. Interference of other underground structures and utilities include in the price bid for subsurface drains.
 - a. The removal and restoration, or protection of existing utilities as shown on the plans.
 - 2. Any dewatering necessary for subsurface drains construction, include in the lump sum price bid.
 - 3. Foundation materials placed in lieu of performing necessary dewatering include in the lump sum price bid.
 - 4. Connection to a proposed or existing pipe culvert, storm sewer pipe, catch basin, manhole or subdrain, included in the lump sum price bid.
 - 5. Bulkheading of existing pipes to be abandoned in place, include in the lump sum price bid.
 - 6. Bedding and encasement materials, include in the lump sum price bid.
 - 7. Crushed rock foundation materials used in lieu of bedding materials in the specified bedding zone.
 - 8. Maintenance of service.
 - 9. The replacement all material displaced due to shrinkage or loss during the excavation and backfilling operations.
 - 10. Protecting existing improvements from damage.

1.3 SPECIFICATION REFERENCES

- A. MnDOT 2502 shall apply to the subsurface drains, except as modified herein.
- B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.4 SUBMITTALS

- A. Piping and fittings - Certificates of Compliance.

PART 2 - PRODUCTS

2.1 SUBSURFACE PIPE AND FITTINGS

- A. Perforated PVC drain pipe, SDR35 (ASTM D3034).
- B. Smooth-walled polyvinyl chloride pipe and fittings shall conform with the requirements of ASTM D3034 for the Standard Dimension Ratio (SDR) of 26.
- C. Tee, wyes, bends, and fittings shall be PVC, SDR 35.

2.2 GRANULAR MATERIALS

- A. The filter aggregate shall conform to the requirements of MnDOT 3149 for coarse filter aggregate, unless otherwise shown on the plans.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. Geo-textile fabric sock shall not be installed.
- B. The Contractor shall install and operate a dewatering system to maintain all trenches free of water wherever necessary. The Contractor shall be responsible for any damage to adjacent structures or buildings caused by the dewatering operations. The Contractor shall make its own subsurface investigations and determine what dewatering methods to utilize to prevent such damage.
- C. Existing inverts shall be protected during construction. If debris enters culverts or sewers, it shall be the responsibility of the Contractor to clean.
- D. Where subdrains are connected to catch basins or manholes, rodent protection shall be installed.

END OF SECTION

SECTION 33 42 00 - STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to storm sewer construction as indicated on the drawings or as specified herein.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. Measurement and compensation for stormwater infrastructure improvements shall be included in the LUMP SUM price bid for the project or bidding section.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances will not be individually paid. The costs will be included in the LUMP SUM price bid. Such items of work include but are not limited to:
 - 1. Locating and connecting to an existing storm sewer, include in the lump sum price bid.
 - 2. The costs of furnishing bends, adapters, cutting and removing the existing storm sewer pipe, include in the lump sum price bid.
 - 3. Locating and connecting to an existing storm sewer service laterals, include in the lump sum price bid.
 - 4. Maintenance of an appropriate storm water outlet during construction, include in the lump sum price bid.
 - 5. Providing temporary bypass pumping / control of stormwater flows around the construction zone, include in the lump sum price bid.
 - 6. The cost of all labor, equipment and materials necessary for testing storm sewer, if required, included in the lump sum price bid.
 - 7. The cost of additional chimney seals or chimney seal extensions to provide complete coverage of all joint between the top of the concrete structure and middle of the cast, shall be included in the lump sum price bid.

1.3 SPECIFICATION REFERENCES

- A. MnDOT 2506 shall apply to manholes, catch basins and castings, except as modified herein.
- B. Reference Section 33 05 06 "Trenching and Backfilling" of this Project Manual, except as modified herein.
- C. CEAM 2621 shall apply to construction of pipe sewers, except as modified herein.
- D. MnDOT 2503 shall apply to measurement and payment of pipe sewers, except as modified herein.
- E. MnDOT Standard Plates Manual with latest revisions.
- F. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.4 SUBMITTALS

- A. Manhole and catch basin structure - shop drawings.
- B. Manhole and catch basin casting - shop drawings.
- C. Piping and fittings - Certificates of Compliance.

PART 2 - PRODUCTS

2.1 OPEN SEWER PIPE AND FITTINGS

- A. Smooth-walled polyvinyl chloride pipe and fittings shall conform with the requirements of ASTM D3034 for the Standard Dimension Ratio (SDR) of 26.

2.2 MANHOLES & CATCH BASINS

-
- A. Precast Concrete Manholes and Catch Basin Section
 - 1. Storm sewer manholes shall conform to the MnDOT Standard for the design type shown on the plans.
 - 2. Reinforced polypropylene plastic steps shall be furnished for all storm sewer manholes.
 - B. Castings
 - 1. All casting assemblies shall meet the certification requirements of the Minnesota Department of Transportation and be manufactured by a MnDOT approved source.
 - 2. The type of casting assembly to be used shall be Neenah R-1733 solid lid with two open lift holes and 2.0-inch raised letters stamped "STORM SEWER". The frame shall be Neenah R-1733.
 - 3. The type of curb and gutter catch basin casting assembly to be used shall be Neenah R-3067-L, unless otherwise specified on the plan.
 - C. Adjusting Rings
 - 1. Only concrete adjusting rings shall be permitted.
 - D. Chimney seals accepted for use, when shown in the plans, shall be one of the following listed as standard of quality:
 - 1. Infi-Shield (exterior only) on catch basins with 2.0-feet x 3.0-feet rectangular opening.
 - 2. Cretex (interior only) on storm manholes and catch basins with 27.0-inch circular opening.

PART 3 - EXECUTION

3.1 MANHOLE AND CATCH BASIN STRUCTURES

- A. Miscellaneous Work
 - 1. When adjusting rings are used, they shall be set with cement mortar and shall be plastered inside and out, with a minimum thickness of ½-inch of mortar. Maximum adjustment allowed between the top cone/slab section and bottom casting is 12.0-inch. A maximum of 3 individual adjusting rings shall be used. Taller 6.0-inch or 12.0-inch rings shall be used where adjustment requires more than 3 (2.0-inch) rings.
 - 2. Chimney seals shall be installed from the top of the concrete structure to the middle of the casting. The Chimney seal(s) shall cover all joints.

END OF SECTION

Geotechnical Evaluation Report

2025-2026 Gorman Park Improvements
511 South 5th Street
Saint Peter, Minnesota

Prepared for

Bolton & Menk, Inc.

Professional Certification:

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of Minnesota.



Philip E. Bailey, PE
Associate Director, Senior Engineer
License Number: 47539
August 9, 2024



Project B2406562

Braun Intertec Corporation

August 9, 2024

Project B2406562

Joe Smith, PE
Bolton & Menk, Inc.
1960 Premier Drive
Mankato, MN 56001

Re: Geotechnical Evaluation
2025-2026 Gorman Park Improvements
511 South 5th Street
Saint Peter, Minnesota

Dear Mr. Smith:

We are pleased to present this Geotechnical Evaluation Report for the 2025-2026 Gorman Park Improvements project in Saint Peter, Minnesota.

Thank you for making Braun Intertec your geotechnical consultant for this project. If you have questions about this report, or if there are other services that we can provide in support of our work to date, please contact Ian Breitlow at 319.423.2317 (ibreitlow@braunintertec.com).

Sincerely,

BRAUN INTERTEC CORPORATION



Ian D. Breitlow
Project Consultant



Philip E. Bailey, PE
Associate Director, Senior Engineer

c: Jeffrey Domras, Bolton & Menk, Inc.

Table of Contents

Description	Page
A. Introduction.....	1
A.1. Project Description	1
A.2. Site Conditions and History	2
A.3. Purpose.....	2
A.4. Background Information and Reference Documents.....	2
A.5. Scope of Services.....	3
B. Results	3
B.1. Geologic Overview	3
B.2. Boring Results.....	4
B.3. Groundwater	4
B.4. Laboratory Test Results.....	5
C. Recommendations	5
C.1. Stormwater Infiltration	5
D. Procedures.....	6
D.1. Penetration Test Borings.....	6
D.2. Exploration Logs	6
D.2.a. Log of Boring Sheets.....	6
D.2.b. Geologic Origins	6
D.3. Material Classification and Testing	7
D.3.a. Visual and Manual Classification.....	7
D.3.b. Laboratory Testing	7
D.4. Groundwater Measurements.....	7
E. Qualifications.....	7
E.1. Variations in Subsurface Conditions.....	7
E.1.a. Material Strata	7
E.1.b. Groundwater Levels	8
E.2. Continuity of Professional Responsibility.....	8
E.2.a. Plan Review	8
E.2.b. Construction Observations and Testing.....	8
E.3. Use of Report.....	9
E.4. Standard of Care.....	9

Appendix

- Soil Boring Location Sketch
- Log of Boring Sheets B-1 and B-2
- Descriptive Terminology of Soil

A. Introduction

A.1. Project Description

This Geotechnical Evaluation Report addresses the proposed design and construction improvements at Gorman Park, located in Saint Peter, Minnesota. The project will include the construction of new concrete walkways, a splash pad, play areas, shaded seating areas, stormwater treatment area, and a landscape buffer zone. We estimate that cuts for the stormwater treatment area will be about 3 to 4 feet.

The figure below shows an illustration of the proposed site layout.

Figure 1. Site Layout

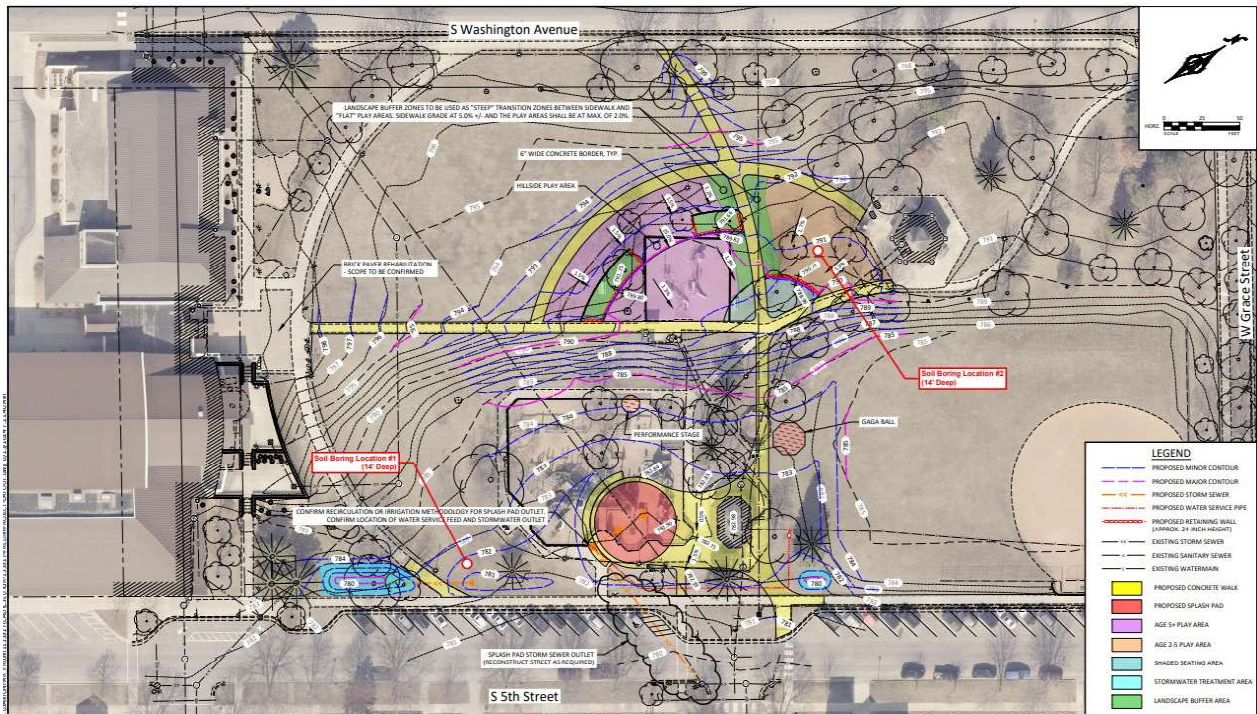


Figure provided by Bolton & Menk, Inc. dated June 25, 2024.

A.2. Site Conditions and History

Currently, the site exists as a grass covered park with scattered trees, playgrounds, sidewalks, a gazebo, and a baseball/softball field in the northeast corner.

Based on the topographic data shown in the provided Preliminary Project Layout, current grades range from 799 feet to 781 feet. Generally, the site slopes downward towards to the east with the highest elevations near South Washington Avenue and the lowest elevations near South 5th Street.

A.3. Purpose

The purpose of our geotechnical evaluation is to characterize subsurface geologic conditions at the requested boring locations.

A.4. Background Information and Reference Documents

We reviewed the following information:

- Preliminary Project Layout prepared by Bolton & Menk, Inc. dated June 25, 2024.
- Email communications with you regarding scope of infiltration recommendations on July 1, 2024.

In addition to the provided sources, we have used several publicly available sources of information including GoogleEarth™ and geological bedrock maps.

We have described our understanding of the proposed construction and site to the extent others reported it to us. Depending on the extent of available information, we may have made assumptions based on our experience with similar projects. If we have not correctly recorded or interpreted the project details, the project team should notify us. New or changed information could require additional evaluation, analyses and/or recommendations.

A.5. Scope of Services

We performed our scope of services for the project in accordance with our Proposal for a Geotechnical Investigation to Bolton & Menk, Inc, (Bolton & Menk) dated July 8, 2024, and authorized on August 9, 2024. The following list describes the geotechnical tasks completed in accordance with our authorized scope of services.

- Reviewed the background information and reference documents previously cited.
- Staked and cleared the exploration location of underground utilities. Bolton & Menk selected, and we staked the new exploration locations. We acquired the surface elevations and locations shown on the boring logs with GPS technology using the State of Minnesota's permanent GPS base station network. The Soil Boring Location Sketch included in the Appendix shows the approximate locations of the borings.
- Performed two (2) standard penetration test (SPT) borings, denoted as B-1 to B-2, to nominal depths between 12 and 14 1/2 feet below grade across the site.
- Performed laboratory testing on selected samples to aid in soil classification and engineering analysis.
- Prepared this report containing a boring location sketch, logs of soil borings, a summary of the soils encountered, results of laboratory tests, and providing infiltration rates for the proposed stormwater improvements based on the Minnesota Stormwater Manual.

B. Results

B.1. Geologic Overview

We based the geologic origins used in this report on the soil types, in-situ and laboratory testing, and available common knowledge of the geological history of the site. Because of the complex depositional history, geologic origins can be difficult to ascertain. We did not perform a detailed investigation of the geologic history for the site.

B.2. Boring Results

Table 1 provides a summary of the soil boring results; in the general order we encountered the strata. Please refer to the Log of Boring sheets in the Appendix for additional details. The Descriptive Terminology sheets in the Appendix include definitions of abbreviations used in Table 1.

Table 1. Subsurface Profile Summary

Strata	Soil Type - ASTM Classification	Range of Penetration Resistances	Commentary and Details
Topsoil	SM	--	<ul style="list-style-type: none"> ▪ Surfacing at each boring location. ▪ Generally, a silty sand or poorly graded sand with varying amount of silt and roots. ▪ Thickness at boring locations was about 22 inches.
Alluvium	SM, SP-SM	4 to 32 Blows Per Foot (BPF)	<ul style="list-style-type: none"> ▪ Encountered in Borings B-1 and B-2 below topsoil to between 7 and 11 feet below ground surface. ▪ Generally, a silty sand or poorly graded sand with silt. ▪ Very loose to dense in relative density. ▪ Moisture condition generally moist to wet.
Residuum	CL	7 BPF to 50 blows for 2 inches of penetration	<ul style="list-style-type: none"> ▪ Encountered in Boring B-2 between 7 and boring termination depth of 14 1/2 feet. ▪ Generally, a gravelly lean clay with sand. ▪ Moisture condition generally moist to wet. ▪ Medium to hard in consistency. ▪ Typically decomposed bedrock.
Bedrock	Sandstone	50 blows for 1 inch of penetration	<ul style="list-style-type: none"> ▪ Top of bedrock elevation was 771 1/2 (B-2). ▪ Generally a slightly weathered sandstone. ▪ Brown and gray in color. ▪ Moisture condition generally moist. ▪ Not encountered in Boring B-1.

B.3. Groundwater

We did not observe groundwater while advancing our borings or immediately after auger withdrawal. However, based on the moisture condition of the retrieved samples and experience in the project area, perched groundwater could be present. Project planning should anticipate seasonal and annual fluctuations of groundwater based on precipitation.

B.4. Laboratory Test Results

The boring logs in the Appendix show the results of laboratory testing we performed, next to the tested sample depth.

The moisture content of the alluvial sands varied from approximately 6 to 22 percent. The moisture content of the residuum gravelly lean clay ranged from 19 to 24 percent.

Our mechanical analyses indicated that the alluvial sands contained 7 to 22 percent silt and clay by weight.

C. Recommendations

C.1. Stormwater Infiltration

We estimated infiltration rates for some of the soils we encountered in our soil borings, as listed in Table 4. These infiltration rates represent the long-term infiltration capacity of a practice and not the capacity of the soils in their natural state. Field testing, such as with a double-ring infiltrometer (ASTM D3385), may justify the use of higher infiltration rates. However, we recommend adjusting field test rates by the appropriate correction factor, as provided for in the Minnesota Stormwater Manual or as allowed by the local watershed. We recommend consulting the Minnesota Stormwater Manual for stormwater design.

Table 4. Estimated Design Infiltration Rates Based on Soil Classification

Soil Type	Infiltration Rate * (inches/hour)
Gravels and gravelly sands	1.63
Sands with less than 12% fines, poorly graded or well graded sands	0.8
Silty sands, silty gravelly sands	0.45
Silts, very fine sands, silty or clayey fine sands	0.2
Clayey sands and clays	0.06

* From Minnesota Stormwater Manual. Rates may differ at individual sites.

Fine-grained soils (silts and clays), topsoil or organic matter that mixes into or washes onto the soil will lower the permeability. The contractor should maintain and protect infiltration areas during construction. Furthermore, organic matter and silt washed into the system after construction can fill the soil pores and reduce permeability over time. Proper maintenance is important for long-term performance of infiltration systems.

This geotechnical evaluation does not constitute a review of site suitability for stormwater infiltration or evaluate the potential impacts, if any, from infiltration of large amounts of stormwater.

D. Procedures

D.1. Penetration Test Borings

We drilled the penetration test borings with a flotation tire-mounted core and auger drill equipped with hollow-stem auger. We performed the borings in general accordance with ASTM D6151 taking penetration test samples at 2 1/2-foot intervals in general accordance with ASTM D1586. The boring logs show the actual sample intervals and corresponding depths.

D.2. Exploration Logs

D.2.a. Log of Boring Sheets

The Appendix includes Log of Boring sheets for our penetration test borings. The logs identify and describe the penetrated geologic materials, and present the results of penetration resistance tests performed. The logs also present the results of laboratory tests performed on test samples, and groundwater measurements.

We inferred strata boundaries from changes in the penetration test samples and the auger cuttings. Because we did not perform continuous sampling, the strata boundary depths are only approximate. The boundary depths likely vary away from the boring locations, and the boundaries themselves may occur as gradual rather than abrupt transitions.

D.2.b. Geologic Origins

We assigned geologic origins to the materials shown on the logs and referenced within this report, based on: (1) a review of the background information and reference documents cited above, (2) visual

classification of the various geologic material samples retrieved during the course of our subsurface exploration, (3) penetration resistance testing performed for the project, (4) laboratory test results, and (5) available common knowledge of the geologic processes and environments that have impacted the site and surrounding area in the past.

D.3. Material Classification and Testing

D.3.a. Visual and Manual Classification

We visually and manually classified the geologic materials encountered based on ASTM D2488. When we performed laboratory classification tests, we used the results to classify the geologic materials in accordance with ASTM D2487. The Appendix includes a chart explaining the classification system we used.

D.3.b. Laboratory Testing

The exploration logs in the Appendix note most of the results of the laboratory tests performed on geologic material samples. The remaining laboratory test results follow the exploration logs. We performed the tests in general accordance with ASTM procedures.

D.4. Groundwater Measurements

The drillers checked for groundwater while advancing the penetration test borings, and again after auger withdrawal. We then filled the boreholes or allowed them to remain open for an extended period of observation, as noted on the boring logs.

E. Qualifications

E.1. Variations in Subsurface Conditions

E.1.a. Material Strata

We developed our evaluation, analyses and recommendations from a limited amount of site and subsurface information. It is not standard engineering practice to retrieve material samples from exploration locations continuously with depth. Therefore, we must infer strata boundaries and thicknesses to some extent. Strata boundaries may also be gradual transitions, and project planning should expect the strata to vary in depth, elevation and thickness, away from the exploration locations.

Variations in subsurface conditions present between exploration locations may not be revealed until performing additional exploration work, or starting construction. If future activity for this project reveals any such variations, you should notify us so that we may reevaluate our recommendations. Such variations could increase construction costs, and we recommend including a contingency to accommodate them.

E.1.b. Groundwater Levels

We made groundwater measurements under the conditions reported herein and shown on the exploration logs, and interpreted in the text of this report. Note that the observation periods were relatively short, and project planning can expect groundwater levels to fluctuate in response to rainfall, flooding, irrigation, seasonal freezing and thawing, surface drainage modifications and other seasonal and annual factors.

E.2. Continuity of Professional Responsibility

E.2.a. Plan Review

We based this report on a limited amount of information, and we made a number of assumptions to help us develop our recommendations. We should be retained to review the geotechnical aspects of the designs and specifications. This review will allow us to evaluate whether we anticipated the design correctly, if any design changes affect the validity of our recommendations, and if the design and specifications correctly interpret and implement our recommendations.

E.2.b. Construction Observations and Testing

We recommend retaining us to perform the required observations and testing during construction as part of the ongoing geotechnical evaluation. This will allow us to correlate the subsurface conditions exposed during construction with those encountered by the borings and provide professional continuity from the design phase to the construction phase. If we do not perform observations and testing during construction, it becomes the responsibility of others to validate the assumption made during the preparation of this report and to accept the construction-related geotechnical engineer-of-record responsibilities.

E.3. Use of Report

This report is for the exclusive use of the addressed parties. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses and recommendations may not be appropriate for other parties or projects.

E.4. Standard of Care

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

Appendix



 DENOTES APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING



30' 0 60'

SCALE: 1"=60'

**BRAUN
INTERTEC**
The Science You Build On.

2120 Howard Drive W. Suite B
North Mankato, MN 56003
507.594.3000
braunintertec.com

Project No:
B2406562

Drawing No:
B2406562

Drawn By: MMH
Date Drawn: 8/1/24
Checked By: IB
Last Modified: 8/1/24

2025 - 2026 Gorman Park Improvements

511 S. 5th Street

Saint Peter, Minnesota

**Soil Boring
Location Sketch**

See Descriptive Terminology sheet for explanation of abbreviations

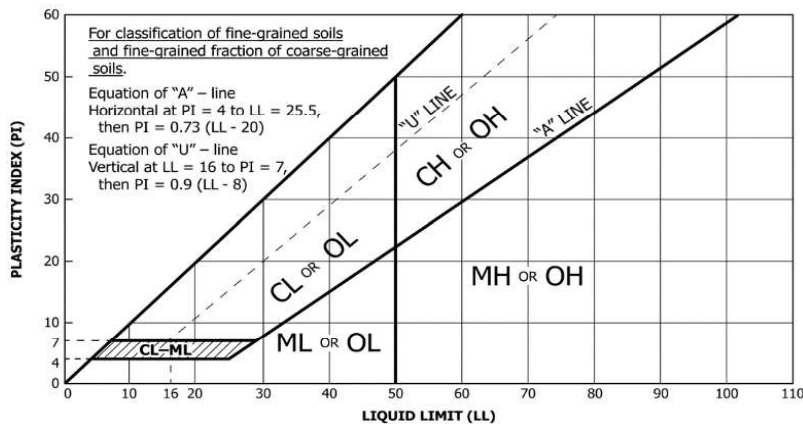
Project Number B2406562					BORING: B-1			
Geotechnical Evaluation					LOCATION: Captured with RTK GPS.			
2025-2026 Gorman Park Improvements					DATUM: NAD 1983 HARN Adj MN Nicollet (US Feet)			
511 S. 5th Street					NORTHING: 273617.5	EASTING: 579395.7		
Saint Peter, Minnesota					START DATE: 07/22/24	END DATE: 07/22/24		
DRILLER: E. Rislov/C. Allen	LOGGED BY: I. Breitlow		SURFACE ELEVATION: 782.5 ft		RIG: 7507	METHOD: 3 1/4" HSA	SURFACING: Grass	WEATHER: Cloudy
Elev./Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks	
780.7		SILTY SAND (SM), with roots, black, moist (TOPSOIL)						
1.8		SILTY SAND (SM), fine to medium-grained, dark gray, moist, very loose to loose (ALLUVIUM)		2-2-2 (4) 6"		14	P200=22%	
776.5			5	2-2-4 (6) 6"		16		
6.0		POORLY GRADED SAND with SILT (SP-SM), fine to coarse-grained, trace Gravel, light brown, moist to wet, loose to dense (ALLUVIUM)		0-1-8 (9) 8"		24	P200=7%	
771.5			10	10-23-9 (32) 2"		18		
11.0		JORDAN FORMATION, SANDSTONE, brown and gray, moist, slightly weathered						
770.4		END OF BORING		50/1" (REF) 1"			Auger met refusal at 12.1 feet	
12.1		Boring then backfilled with auger cuttings					Water not observed while drilling.	
			15					

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2406562					BORING: B-2			
Geotechnical Evaluation					LOCATION: Captured with RTK GPS.			
2025-2026 Gorman Park Improvements					DATUM: NAD 1983 HARN Adj MN Nicollet (US Feet)			
511 S. 5th Street					NORTHING: 273938.0	EASTING: 579323.8		
Saint Peter, Minnesota					START DATE: 07/22/24	END DATE: 07/22/24		
DRILLER: E. Rislov/C. Allen	LOGGED BY: I. Breitlow		SURFACE ELEVATION: 790.5 ft		RIG: 7507	METHOD: 3 1/4" HSA	SURFACING: Grass	WEATHER: Cloudy
Elev./Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks	
788.7		SILTY SAND (SM), with roots, black, moist (TOPSOIL)						
1.8		SILTY SAND (SM), fine to medium-grained, dark gray, moist, loose (ALLUVIUM)		2-2-3 (5) 12"		6		
			5	3-3-4 (7) 12"		13		
783.5		GRAVELLY LEAN CLAY with SAND (CL), light brown to gray, moist to wet, medium to hard (RESIDUUM)		8-50/2" (REF) 4"		21		
7.0			10	12-14-9 (23) 10"		19		
				3-3-4-3 (7) 8"		24		
776.0		END OF BORING	15				Water not observed while drilling.	
14.5		Boring then backfilled with auger cuttings						

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification		
				Group Symbol	Group Name ^B	
Coarse-grained Soils (more than 50% retained on No. 200 sieve)	Gravels (More than 50% of coarse fraction retained on No. 4 sieve)	Clean Gravels (Less than 5% fines ^C)	$C_u \geq 4$ and $1 \leq C_c \leq 3^D$	GW	Well-graded gravel ^E	
			$C_u < 4$ and/or ($C_c < 1$ or $C_c > 3$) ^D	GP	Poorly graded gravel ^E	
		Gravels with Fines (More than 12% fines ^C)	Fines classify as ML or MH	GM	Silty gravel ^{EFG}	
			Fines Classify as CL or CH	GC	Clayey gravel ^{EFG}	
	Sands (50% or more coarse fraction passes No. 4 sieve)	Clean Sands (Less than 5% fines ^H)	$C_u \geq 6$ and $1 \leq C_c \leq 3^D$	SW	Well-graded sand ^I	
			$C_u < 6$ and/or ($C_c < 1$ or $C_c > 3$) ^D	SP	Poorly graded sand ^I	
		Sands with Fines (More than 12% fines ^H)	Fines classify as ML or MH	SM	Silty sand ^{FGI}	
			Fines classify as CL or CH	SC	Clayey sand ^{FGI}	
Fine-grained Soils (50% or more passes the No. 200 sieve)	Silts and Clays (Liquid limit less than 50)	Inorganic	PI > 7 and plots on or above "A" line ^J	CL	Lean clay ^{KLM}	
			PI < 4 or plots below "A" line ^J	ML	Silt ^{KLM}	
		Organic	Liquid Limit – oven dried	< 0.75	OL	Organic clay ^{KLMN}
			Liquid Limit – not dried		OH	Organic silt ^{KLMQ}
	Silts and Clays (Liquid limit 50 or more)	Inorganic	PI plots on or above "A" line	CH	Fat clay ^{KLM}	
			PI plots below "A" line	MH	Elastic silt ^{KLM}	
		Organic	Liquid Limit – oven dried	< 0.75	OH	Organic clay ^{KLMQ}
			Liquid Limit – not dried		OL	Organic silt ^{KLMQ}
Highly Organic Soils	Primarily organic matter, dark in color, and organic odor			PT	Peat	

- A. Based on the material passing the 3-inch (75-mm) sieve.
- B. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
- C. Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay
- D. $C_u = D_{60} / D_{10}$ $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
- E. If soil contains $\geq 15\%$ sand, add "with sand" to group name.
- F. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
- G. If fines are organic, add "with organic fines" to group name.
- H. Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay
- I. If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.
- J. If Atterberg limits plot in hatched area, soil is CL-ML, silty clay.
- K. If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant.
- L. If soil contains $\geq 30\%$ plus No. 200, predominantly sand, add "sandy" to group name.
- M. If soil contains $\geq 30\%$ plus No. 200 predominantly gravel, add "gravelly" to group name.
- N. PI ≥ 4 and plots on or above "A" line.
- O. PI < 4 or plots below "A" line.
- P. PI plots on or above "A" line.
- Q. PI plots below "A" line.



Laboratory Tests			
DD	Dry density, pcf	q_p	Pocket penetrometer strength, tsf
WD	Wet density, pcf	q_u	Unconfined compression test, tsf
P200	% Passing #200 sieve	LL	Liquid limit
MC	Moisture content, %	PL	Plastic limit
OC	Organic content, %	PI	Plasticity index

Particle Size Identification

- Boulders..... over 12"
- Cobbles..... 3" to 12"
- Gravel
Coarse..... 3/4" to 3" (19.00 mm to 75.00 mm)
Fine..... No. 4 to 3/4" (4.75 mm to 19.00 mm)
- Sand
Coarse..... No. 10 to No. 4 (2.00 mm to 4.75 mm)
Medium..... No. 40 to No. 10 (0.425 mm to 2.00 mm)
Fine..... No. 200 to No. 40 (0.075 mm to 0.425 mm)
- Silt..... No. 200 (0.075 mm) to .005 mm
- Clay..... < .005 mm

Relative Proportions^{L-M}

- trace..... 0 to 5%
- little..... 6 to 14%
- with..... $\geq 15\%$

Inclusion Thicknesses

- lens..... 0 to 1/8"
- seam..... 1/8" to 1"
- layer..... over 1"

Apparent Relative Density of Cohesionless Soils

- Very loose 0 to 4 BPF
- Loose 5 to 10 BPF
- Medium dense..... 11 to 30 BPF
- Dense..... 31 to 50 BPF
- Very dense..... over 50 BPF

Consistency of Cohesive Soils Blows Per Foot Approximate Unconfined Compressive Strength

- Very soft..... 0 to 1 BPF..... < 0.25 tsf
- Soft..... 2 to 4 BPF..... 0.25 to 0.5 tsf
- Medium..... 5 to 8 BPF..... 0.5 to 1 tsf
- Stiff..... 9 to 15 BPF..... 1 to 2 tsf
- Very Stiff..... 16 to 30 BPF..... 2 to 4 tsf
- Hard..... over 30 BPF..... > 4 tsf

Moisture Content:

- Dry:** Absence of moisture, dusty, dry to the touch.
- Moist:** Damp but no visible water.
- Wet:** Visible free water, usually soil is below water table.

Drilling Notes:

Blows/N-value: Blows indicate the driving resistance recorded for each 6-inch interval. The reported N-value is the blows per foot recorded by summing the second and third interval in accordance with the Standard Penetration Test, ASTM D1586.

Partial Penetration: If the sampler could not be driven through a full 6-inch interval, the number of blows for that partial penetration is shown as #/x" (i.e. 50/2"). The N-value is reported as "REF" indicating refusal.

Recovery: Indicates the inches of sample recovered from the sampled interval. For a standard penetration test, full recovery is 18", and is 24" for a thinwall/shelby tube sample.

WOH: Indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WOR: Indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

Water Level: Indicates the water level measured by the drillers either while drilling (), at the end of drilling (), or at some time after drilling ().

Sample Symbols

	Standard Penetration Test		Rock Core
	Modified California (MC)		Thinwall (TW)/Shelby Tube (SH)
	Auger		Texas Cone Penetrometer
	Grab Sample		Dynamic Cone Penetrometer