SECTION 00 01 01
PROJECT TITLE PAGE

24602002 - RVC - ATHLETIC FIELD SPRINKLER AND DRAINAGE

ARCHITECT'S PROJECT NUMBER: 24602002

ROCK VALLEY COLLEGE, DISTRICT 511

3301 N MULFORD RD., ROCKFORD, IL 61114

SALES TAX EXEMPTION NUMBER: E9992-3450-

DATE: 11/06/2024

PREPARED BY:

OPN ARCHITECTS

END OF SECTION

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SECTION 00 01 03
PROJECT DIRECTORY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification of project team members and their contact information.

1.02 OWNER:

A. Name: Rock Valley College.
   1. Address Line 1: 3301 N Mulford Rd.
   2. City: Rockford.
   3. State: Illinois .
   4. Zip Code: 61114.
   5. Telephone: 815-921-4312.

B. Primary Contact: All correspondence from the Contractor to the Architect will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
   1. Title: Project Manager.
   2. Name: Janet Taylor.
   3. Email: j.taylor@rockvalleycollege.edu.

1.03 CONSULTANTS:

A. Architect: Design Professional of Record. All correspondence from the Architect to Contractor regarding construction documents authored by Architect's consultants will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
   1. Company Name: OPN Architects, Inc..
      a. Address Line 1: 301 N Broom St. Ste 100.
      b. City: Madison.
      c. State: WI.
      d. Zip Code: 53703.
      e. Telephone: 608.572.2588.
   2. Primary Contact:
      a. Title: Project Architect.
      b. Name: Brett Rottinghaus.
      c. Email: brottinghaus@opnarchitects.com.

B. Civil Engineering Consultant:
   1. Company Name: IMEG Corp..
      a. Address Line 1: 401 E State St., 4th floor.
      b. City: Rockford.
      c. State: Illinois.
      d. Zip Code: 61104.
      e. Telephone: 309.296.0407.
   2. Primary Contact:
      a. Title: Client Executive.
      b. Name: Eric C. Moe.
      c. Email: Eric.C.Moe@imegcorp.com.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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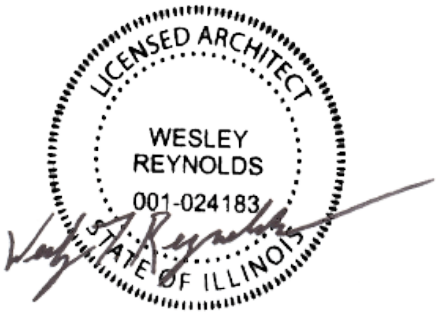
SECTION 00 01 07
SEALS PAGE



END OF SECTION

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SECTION 00 01 10
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SECTION 00 11 13
ADVERTISEMENT FOR BIDS

FROM:

1.01 THE OWNER (HEREINAFTER REFERRED TO AS OWNER):

A. Rock Valley College

B. Address:
3301 N Mulford Rd
Rockford, IL, 61114

1.02 AND THE ARCHITECT (HEREINAFTER REFERRED TO AS ARCHITECT):

A. OPN Architects, Inc.

B. 301 N. Broom Street, Suite 100, Madison, WI 53703

1.03 TO: POTENTIAL BIDDERS

A. On behalf of Rock Valley College, sealed bids will be received Rock Valley College, SSB Conference Room 1309, 3301 N Mulford Rd, Rockford, IL 61114-5699, until 2:00 p.m. local time on Wednesday, November, 20th, 2024.

B. All Submittals are to contain the following:
1. Two (2) hard copies and one (1) Digital Device: Submitted on or before the specified closing time in an opaque sealed envelope addressed to:
   a. Karen Kerr, Director of Business Services
   b. Business Services, SSB 2205
   c. Rock Valley College
   d. 3301 N Mulford Rd
   e. Rockford IL 61114-5699

C. All envelopes should be plainly marked, with the Bidder's Name and Address and the following notation: Bid #24-05 - Rock Valley College - Athletic Field Sprinkler and Drainage.

D. EMAILS OR FAXES ARE NOT ACCEPTABLE

E. BIDs:
1. Bids will be received and publicly read aloud by Rock Valley College at the place, date and time hereinafter designated. You are invited to be present if you so desire.

F. OPENING DATE AND TIME:
1. Wednesday, November 20th , 2024
2. 2:00 p.m. Central Standard Time

G. PLACE:
1. Rock Valley College
2. SSB Conference Room 1309
3. 3301 N Mulford Rd
4. Rockford, IL 61114-5699

H. Summary: The project scope includes construction of new irrigation systems, including a new variable-speed irrigation pump, and new slit-trench subdrainage systems for the existing natural grass baseball, softball, soccer game and soccer practice fields at RVC's main campus at 3301 N Mulford Rd, Rockford, IL. Other related construction items include extension of the irrigation system to provide irrigation for the existing grass-surfaced median in the Rock Valley College Main Access Road and an Alternate Bid item to construct new freeze-proof yard hydrants served by a new potable water line. The soccer game and practice fields are to be restored with top dressing, and the baseball and softball fields are to be sodded. .

I. Awards of the Contract is anticipated to commence within 14 (fourteen) days of Board Approval on December 17, 2024. Work may begin during the winter break and the execution of the agreement and is completed in one phase. Schedule to be coordinated with the Owner during project kick-off meeting.

J. PRE-BID MEETING / SITE TOUR: A non-mandatory pre-bid meeting will be held on Tuesday, November 12, 2024, at 11:00 A.M. The meeting will begin in room 1309 of the SSB building and will be followed by a site visit if requested.

K. QUESTIONS: Must be submitted no later than 12:00 P.M. (Noon) CST on Wednesday, November 13, 2024 via email to Karen Kerr at k.kerr@rockvalleycollege.edu.

L. FINAL ADDENDUM: The final addendum will be posted Thursday, November 14, 2024 by 12:00 PM (end of day)

M. Bid security in the amount of ten percent (10%) of the total base bid in the form of certified check, credit union share draft, or surety bond written on an original AIA Document A310, Bid Bond, is required for this project at the time of Bid. The successful bidder will be required to provide surety Performance and Payment Bonds in an amount equal to one hundred percent (100%) of the Contract Sum.

N. Interested bidders shall submit a completed Bidder's Status Form (See Section 00 60 00 - Project Forms for a copy of this form) at the time of Bid.

O. The award of the contract may be made by Rock Valley College Board of Trustees to any responsible bidder or bidders offering suitable supplies, equipment and/or service at the lowest price taking into consideration the quality of materials or service in the best interest of the Owner. The right is reserved to reject any and all bids, or any part thereof, and to waive informalities, and to enter into such contract or contracts as shall be deemed in the best interest of the Owner.

END OF SECTION

SECTION 00 21 13
INSTRUCTIONS TO BIDDERS

American Institute of Architects Document A701 - 2018, Instructions to Bidders, is hereby incorporated in this specification by reference and is available from the Architect: OPN Architects, Inc., 301 North Broom Street, Suite 100, Madison, WI 53703. The Instructions to Bidders, including modifications and special instructions, shall apply to all Bidders and Sub-Bidders.

END OF SECTION 00 21 13

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SECTION 00 22 13
SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

The following supplements modify, change, delete from or add to the "Instructions to Bidders", AIA Document A701, 2018 Edition. Where any Article of the Instructions is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by these Supplementary Conditions, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect.

ARTICLE 3: BIDDING DOCUMENTS

1. Paragraph 3.2 Modification or Interpretation of Bidding Documents

   A. Sub-paragraph 3.2.2; replace with the following:

      "An ambiguity, inconsistency, or error discovered too late to be clarified or interpreted by Addendum shall be handled in the following manner:

      .1 The Bidder or Sub-bidder shall promptly notify the Architect.

      .2 The Bidder or Sub-bidder shall determine, to the best of his ability, the proper methods or materials required to fulfill the design intent of the Architect and shall include the cost of providing such methods or materials in this Bid or Sub-bid.

      .3 The Bidder or Sub-bidder shall submit with the Bid, as supplemental information, descriptions of the ambiguity, inconsistency, or error and the methods or materials which he has included in the Bid.

      .4 The Owner, Construction Manager and Architect will review the supplemental information prior to awarding the Contract."

2. Paragraph 3.3 Substitutions

   A. Sub-paragraph 3.3.2; add the following:

      ".1 All substitution requests shall be submitted on the Substitution Request Form included in the Project Specification Manual. All substitution requests submitted must be complete with all requested information. Incomplete forms and requests submitted on other forms shall be disregarded."

3. Paragraph 3.4 Addenda

   A. Paragraph 3.4.3; add the following to the end of paragraph:

      ".....or in a case deemed an emergency by the Architect or Owner."

ARTICLE 4: BIDDING PROCEDURES

1. Paragraph 4.1 Preparation of Bids

   A. Sub-paragraph 4.1.1; add the following sentence:

      1. "Bidders shall include an original copy of the Bid in the submittal envelope."

2. Paragraph 4.2 Bid Security

A. Sub-paragraph 4.2.1; add the following:

"4.2.1.1 Bid Security in the amount of ten percent (10%) of the Bid shall be presented as:

.1 A certified check on a solvent Illinois bank, made payable to the Owner; or,

.2 A surety bond from a surety company authorized to do business in the state of Illinois; or

.3 A certified share draft on a solvent Illinois credit union, made payable to the Owner."

B. Sub-paragraph 4.2.4; revise final sentence as follows:

1. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning 60 days after the opening of Bids, withdraw its Bid and request the return of its bid security."

3. Paragraph 4.3 Submission of Bids

A. Sub-paragraph 4.3.1; delete this paragraph and add the following:

"4.3.1 Bids must be in accordance with the instructions contained herein. All Submittals are to contain a total of **two (2) hard copies and 1 digital device**. They shall be submitted on or before the specified closing time in an opaque sealed envelope addressed to:

Karen Kerr, Director of Business Services

Business Services, SSB 2205

Rock Valley College

3301 N Mulford Rd

Rockford IL 61114-5699

All envelopes should be plainly marked, with the Bidder's Name and Address and the notation of the project name listed in the advertisement for bid

B. Sub-paragraph 4.3.6; add the following:

"4.3.6 Bids shall remain in force and effect for thirty (30) days after opening of the Bid.

4. Paragraph 4.4 Modification or Withdrawal of Bid

A. Sub-paragraph 4.4.3; add the following:

"4.4.3.1 At the Owner's discretion, If the withdrawn bid is the low bid, the Owner will retain a portion of the bid security equal to the difference between the low bid and the next-lowest bid. This amount of the bid security shall be forfeited to the Owner as a measure of liquidated damages which the Owner will sustain resulting from failure, neglect, or refusal of the Bidder to deliver a signed contract stipulating the scope and performance of the Work as defined in the Bid Documents. Contract will include unqualified compliance with

the Contract Documents as bid and must be executed within fourteen (14) calendar days after the notification of award is issued."

ARTICLE 6: POST-BID INFORMATION

Sub-paragraph 6.3.1; delete “as soon as practicable or as stipulated in the Bidding Documents” and insert “within three (3) business days.”

ARTICLE 7: PERFORMANCE BOND AND PAYMENT BOND

1. Paragraph 7.1 Bond Requirements

   A. Sub-paragraph 7.1.1; delete this paragraph and add the following:

      "7.1.1 The Bidder shall furnish bonds covering the faithful performance of the Contract and the payment of all obligations arising thereunder in an amount equal to the total Contract Sum. Bonds may be secured through the Bidder's usual sources. The cost of the Bonds shall be included in the Bid."

   B. Sub-paragraph 7.1.2; delete this paragraph.

ARTICLE 8: ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

1. Subparagraph 8.1.5 Drawings: Add the following: “Refer to Index on Drawing Cover Sheet.”

2. Subparagraph 8.1.6 Specifications: Add the following: “Refer to Table of Contents in Project Specifications Manual.”

3. Subparagraph 8.1.7 Addenda: Add the following: “To be determined during bidding.”

ARTICLE 9: CORRECTION OF WORK

1. Paragraph 9.1 Correction of Work after Substantial Completion; add the following:

   A. The Bidder shall be required to extend the one-year correction of work period called out in Paragraph 12.2.2 of the General Conditions of the Contract for Construction by one year, resulting in a two year period from the date of Substantial Completion where he will be required to correct Work found not to be in accordance with the requirements of the Contract Documents. The cost of the extension shall be included in the Bid.”

ARTICLE 10: SUPPLEMENTARY INSTRUCTIONS

1. Paragraph 10.1 Reference

   A. "10.1 Reference; add the following

      1. All references to provisions in Article 10 - Supplementary Instructions to Bidders are hereby transferred to Section 00 21 13 - Supplementary Instructions to Bidders. Any modifications stated in Section 00 21 13 shall have the same force and effect as if stated in Article 10."

END OF SECTION 00 21 13

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SECTION 00 22 15
SPECIAL INSTRUCTIONS

Special Instructions to bidders, as herein stated, are hereby incorporated in this specification. The Special Instructions shall apply to all Bidders and Sub-bidders.

1. EQUAL EMPLOYMENT OPPORTUNITY: "Bidder agrees that if awarded the Contract to supply any part of the above material, bidder will not engage in any discriminatory employment practices based on race, color, religion, sexual orientation or national origin and that they will in all contracts comply with all statutes of the State of Illinois against discrimination. Failure to do so could be deemed a material breach of contract.

END OF SECTION 00 22 15

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SECTION 00 25 13
PRE-BID CONFERENCE

Prior to submission of Bids, a non-mandatory conference will be held for all bidders and sub-bidders considering a bid on Bid#24-05 - RVC - Athletic Field Sprinkler and Drainage project to review the general requirements and answer questions regarding the project. The conference will be held at 3301 N Mulford Rd, SSB Conference Room 1309, Rockford, IL 61114 on Tuesday, November 12, 2024 at 11:00 a.m.

END OF SECTION 00 25 13

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SECTION 00 41 13
BID FORMS

Bids for construction contracts must be submitted on a copy of the attached bid form.

TO: Rock Valley College

herein called “Owner”

FROM: _____ (Contractor’s Name)

DATE: _____

1. In compliance with the Advertisement for Bids and the proposed Contract Documents relating to the:

   Bid #24-05- RVC - Athletic Field Sprinkler and Drainage

   Project Number: 24602002

   including Addenda _____, _____, _____, _____.

   By initialing below, Vendor is acknowledging the use of the AIA A101 and AIA A201 as amended.

   INITIAL HERE: _____

   the undersigned hereby proposes and agrees to fully perform the Work within the time stated and in strict accordance with the proposed Contract Documents dated 11/06/2024, including furnishing labor and/or materials, and to do all of the work required to construct and complete said Work in accordance with the Contract Documents as follows:

   For complete Construction as described in the Bidding Documents:

   BASE BID:

   _____ dollars ($_____)

   10% CONTINGENCY:

   _____ dollars ($_____)

   TOTAL *(Base Bid + 10% Contingency):*

   _____ dollars ($_____)

   The above total is to include the BASE BID and the 10% CONTINGENCY

   ALTERNATE BIDS: Bidder agrees to perform all work shown or specified in the bidding documents required for completion of the listed Alternate Bids, when accepted and incorporated into the Contract. Refer to Division 1 Section 01 23 00 - Alternates for alternate

descriptions.

ALTERNATE NO. 1 - 2" Water Service Extension ADD Lump Sum:

ADD/DEDUCT _____ dollars ($_____)

I understand that the Owner reserves the right to reject this Bid, but that this Bid shall remain open and not be withdrawn for a period of thirty days from the date of the Bid Opening.

Notice of acceptance, or request for additional information, may be addressed to the undersigned at the address set forth below.

I agree to complete the work within the schedule of completion stated in the Bidding Documents.

SIGN HERE:

_____

_____

_____

Signature of Bidder

Note: If bidder is a corporation, set forth the legal name of the corporation together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation. If bidder is a partnership, set forth the name of the firm together with the signature of the partner or partners authorized to sign contracts on behalf of the partnership.

BUSINESS ADDRESS:

_____

_____

_____

TELEPHONE NUMBER:

_____

END OF SECTION 00 41 13

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SECTION 00 43 13
SUPPLEMENTS TO BID FORMS

In accordance with the Instructions to Bidders and Supplementary Instructions to Bidders, submit the following forms:

1. Bid Security: A certified check, a surety bond written on an original AIA Document A310, Bid Bond, Current Edition, or a certified share draft. The Bid Security shall be in an amount to cover ten percent (10%) of the total bid amount (including all Add Alternates).

END OF SECTION 00 43 13

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SECTION 00 52 00
AGREEMENT FORM

American Institute of Architects Document A101 - 2017, Standard Agreement Between Owner and Contractor, is hereby incorporated by reference in this specification and is available from the Architect: OPN Architects, Inc., 301 North Broom Street, Suite 100, Madison, WI 53703. It shall be the Agreement for the Work.

END OF SECTION

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SECTION 00 60 00
PROJECT FORMS

Insurance Types and Limits

Insurance types and limits required for this project are described in Section 11 of the AIA Document A201-2017, as modified. A copy of this document is included after this section. Exhibit A

End of Section

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SECTION 00 61 13
BONDS AND CERTIFICATES

American Institute of Architects Document A312, Performance Bond and Labor and Material Payment Bond, December 1984, and Document G715–1991, Supplemental Attachment for ACORD Certificate of Insurance 25-S, 2001 Edition, or ACCORD form 25-S, shall be submitted to fulfill the requirements of the Bidding Documents. All submittals shall be on original forms with original signatures.

END OF SECTION 00 61 13

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SECTION 00 63 25
SUBSTITUTION REQUEST FORM - DURING CONSTRUCTION

Project:

We hereby submit for your consideration the following product instead of the specified item for the above project:

Drawings/Specifications:

Drawing Name/Number: _____

Spec Section/Name: _____

Paragraph: _____

Specified Item: _____

Proposed Substitution: _____

Attach complete information on changes to Drawings and/or Specifications which proposed substitution will require for its proper installation. Failure to fully complete this form is the basis to not accept this Substitution Request.

Submit, with request, all necessary samples and substantiating data to prove equal quality and performance to that which is specified. Clearly mark manufacturer's literature to indicate equality in performance.

CERTIFICATION OF EQUAL PERFORMANCE AND ASSUMPTION OF LIABILITY FOR EQUAL PERFORMANCE

The undersigned states that the function, appearance, and quality are equivalent or superior to the specified item.

SUBMITTED BY: _____

SIGNATURE: _____ TITLE: _____

FIRM: _____

ADDRESS: _____

TELEPHONE: _____ E-MAIL: _____ DATE: _____

Signature shall be by person having authority to legally bind firm to the above items. Failure to provide binding signature will result in retraction of approval.

For Use by Owner's Representative or Owner:

O Accepted O Accepted as Noted O Not Accepted O Received Too Late

By: _____

Date: _____

Fill in Blanks Below (All items must be completed):

A. Does the substitution affect dimensions shown on Drawings? Yes _____ No _____

If yes, clearly indicated changes:

_____

_____

B. Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution? Yes _____ No _____

If no, fully explain: _____

_____

_____

C. What effect does substitution have on other Contracts or other trades?

_____

_____

_____

D. What effect does substitution have on construction schedule?

_____

_____

_____

E. Manufacturer's warranties of the proposed and specified items are:

_____ Same _____ Different (Explain on Attachment)

F. Reason for Not Providing Specified Product: _____

_____

_____

_____

G. Itemized comparison of specified item(s) with the proposed substitution.

List significant variations:

_____

_____

H. Accurate cost data comparing proposed substitution with product specified.

_____

_____

I. Designation of maintenance services and sources:

_____

_____

J. Savings to Owner for Accepting Substitution: $_____

(ATTACH ADDITIONAL SHEETS IF REQUIRED)

END OF SECTION

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SECTION 00 72 00
GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

RELATED REQUIREMENTS

1. SECTION 01 42 16 - Definitions.

American Institute of Architects Document A201-2017, General Conditions of the Contract for Construction, as modified, is hereby incorporated in this specification by reference and is included in the bid package. The General Conditions, including modifications and Special Conditions shall apply to all contractors and sub-contractors. In the event of any conflict between the A201 General Conditions, as modified, and the Special Conditions or any other terms other contract documents in the bid package, the A201 General Conditions General Conditions shall prevail.

END OF SECTION

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SECTION 00 73 10
SPECIAL CONDITIONS

TARGETED SMALL BUSINESS PROCUREMENT GOAL:

It is hereby agreed that when entering into this contract with the Owner, the Prime Contractors will take documented steps to encourage participation from disadvantaged business enterprises (DBE) for the purpose of subcontracting or supplying material. DBE participation goal of at least ten percent (10%).

EQUAL OPPORTUNITY EMPLOYMENT/AFFIRMATIVE ACTION: Rock Valley College ("RVC") is an Equal Opportunity/Affirmative Action Employer. In the event of the Contractor's noncompliance with any provision of this Equal Employment Opportunity Clause, the Illinois Fair Employment Practice Act, or the Fair Employment Practices Commission's Rules and Regulations for Public Contracts, the Contractor may be declared non-responsible an d therefore ineligible for future contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporation and the Contract may be cancelled or avoided in whole, or in part, and such other sanctions or penalties may be imposed or remedies invoked as provided by statute or regulation.

1. It is also RVC's policy to promote the economic development of businesses owned by minorities, females and persons with disabilities by setting aspirational goals to award contracts to businesses owned by minorities, females, and persons with disabilities for certain services as provided by the Business Enterprise for Minorities, Females and Persons with Disabilities Act, 30 ILCS 575 (the Act) and the Business Enterprise Council for Minorities, Females, and Persons with Disabilities.

2. If Contractor is certified with the State of Illinois as a BEP vendor, include a copy verifying such certification.

3. To register with the State of Illinois as an MBE/FBE/DBE, please visit this site: https://www.illinois.gov/cms/business/sell2/bep/Pages/Vendor_Registration.aspx

END OF SECTION 00 73 10

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SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: 24602004 - Rock Valley College - Athletic Field Sprinkler and Drainage

B. Owner's Name: Rock Valley College

C. Architect's Name: OPN Architects, Inc.

D. Project Description: The project scope includes construction of new irrigation systems, including a new variable-speed irrigation pump, and new slit-trench subdrainage systems for the existing natural grass baseball, softball, soccer game and soccer practice fields at RVC's main campus at 3301 N Mulford Rd, Rockford, IL. Other related construction items include extension of the irrigation system to provide irrigation for the existing grass-surfaced median in the Rock Valley College Main Access Road and an Alternate Bid item to construct new freeze-proof yard hydrants served by a new potable water line. The soccer game and practice fields are to be restored with top dressing, and the baseball and softball fields are to be sodded.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a total Stipulated Price.

1.03 OWNER OCCUPANCY

A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.
   1. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations.
   2. Maintain exits in a safe manner that is custom for industry standards, unless otherwise indicated.
   3. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities in a safe manner that is custom for industry standards. Do not close or obstruct Walkways, corridors or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
   4. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

B. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
   1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
   2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
   3. Before partial Owner occupancy, Contractor shall ensure that mechanical and electrical systems are fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
   4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.04 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.
   1. Locate and conduct construction activities in ways that will limit disturbance to site.
   2. Staging for each project will be coordinated with owner and contractor prior to commencing work and during pre-construction meeting.

3. Staging area is to be as agreed upon between the contractor and the owner. Final location will be identified during the pre-construction meeting.

B. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Work by Owner.
   3. Use of site and premises by the public.

C. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily.
   2. Do not obstruct roadways, sidewalks, or other public ways without a permit.

D. Utility Outages and Shutdown:
   1. Limit disruption of utility (drainage) services. Coordinate disruptions with the Owner in advance.
   2. If applicable, do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without seven (7) days' notice to Owner and authorities having jurisdiction.
   3. If applicable, utility outages or interruptions should occur when buildings are not occupied. Final schedule will be discussed during pre-construction.
   4. Prevent accidental disruption of utility services to other facilities.

E. Noise, Vibration and Odors: Coordinate operations that may result in high levels of noise and vibration, odors or other disruption to Owner occupancy with Owner.
   1. Notify Architect and Owner not less than two (2) days in advance of proposed disruptive operations.
   2. Coordinate with Owner to prevent disruption of learning environment.

F. Nonsmoking Campus: Smoking or any tobacco use is not permitted on the school campus.

1.05 WORK SEQUENCE

A. The Work shall be conducted in a single phase.

B. Before commencing work, submit a schedule showing the sequence, commencement and completion dates, and move-out dates of owner's personnel.

1.06 WORK UNDER OTHER CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Section 00 50 00 - Contracting Forms and Supplements: Forms to be used.

1.03 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
   1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with continuation sheets.
      b. Submittal schedule.
      c. Items required to be indicated as separate activities in Contractor's construction schedule.
   2. Submit the schedule of values to Architect at earliest possible date, but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.
   3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
   4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
   5. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide subschedules showing values coordinated with the scope of each design services contract as described in Division 01 Section "Summary."

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the schedule of values:
      a. Project name and location.
      b. Name of Architect.
      c. Architect's project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Arrange schedule of values consistent with format of AIA Document G703 .
   3. PREVAILING WAGE LAW: This Project requires the vendor to comply with the Illinois Prevailing Wage Act, 820 ILCS 130/0.01 *et seq*., (the "Act") and to make, keep and file certified payroll in accordance with the Act. The Contractor further agrees to provide a copy of the certified payroll to the Facilities Director and the Illinois Department of Labor on a monthly basis for the duration of the project. Prevailing wage rates applicable to the project are located here: https://www2.illinois.gov/idol/Laws-Rules/CONMED/Documents/2019%20Rates/July%2015/Winnebago.pdf
   4. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
      a. Related Specification Section or Division.
      b. Description of the Work.
      c. Name of subcontractor.

d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that affect value.
g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total one hundred percent (100%).
1) Labor.
2) Materials.
3) Equipment.

5. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
a. Include separate line items under Contractor and principal subcontracts for LEED documentation and other Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
6. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
7. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
8. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
9. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
10. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
11. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
12. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

C. For each item, provide a column for listing each of the following:
1. Item Number.
2. Description of work.
3. Previous Applications.
4. Work in Place and Stored Materials under this Application.
5. Authorized Change Orders.
6. Total Completed and Stored to Date of Application.
7. Percentage of Completion.
8. Balance to Finish.
9. Retainage.

D. Execute certification by signature of authorized officer. Applications shall be notarized. Architect will return incomplete applications without action.

1. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
2. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
3. Submit electronic copies of each Application for Payment.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
   1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
   2. Provide supporting documentation that verifies the amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
   3. Provide summary documentation for stored materials indicating the following:
      a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
      b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
      c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
   1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
   2. When an application shows completion of an item, submit final or full waivers.
   3. Owner reserves the right to designate which entitles involved in the Work must submit waivers.
   4. Waivers: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.
   5. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. List of subcontractors.
   2. Schedule of Values.
   3. Contractor's Construction Schedule (preliminary if it's not final).
   4. Schedule of unit prices, if applicable.
   5. Submittals Schedule (preliminary if not final).
   6. List of Contractor's staff assignments.
   7. Copies of building permits.
   8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
   9. Certificates of insurance and insurance policies.
   10. Performance and Payment Bonds.
   11. Information required for Owner's insurance.

H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing one hundred percent (100%) completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting the claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
   2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not prevously submitted and accepted, including but not limited tot he following:
   1. Evidence of completion of Project closeout requirements.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
   5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
   6. AIA Docuement G707, "Consent of Surety to Final Payment."
   7. Evidence that claims have been settled.
   8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
   9. Removal of temporary facilities and services.
   10. Change of door locks to Owner's access.

1.05 MODIFICATION PROCEDURES

A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on "Architect's Instruction to Contractor" (ITC) form.

B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor by ITC.

C. Owner-Initiated Proposal Requests or ITC's: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Proposal Requests or ITC's issued by Architect are for information only. Do not consider the instructions either to stop work in progress or to execute the proposed change.
   2. Within fourteen (14) days after receipt of Proposal Request or ITC, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include costs of labor and supervision directly attributable to the change.
      d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

D. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate a method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

E. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within seven (7) days.

F. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

G. Allowances:
1. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
   a. Include installation costs in purchase amount only where indicated as part of the allowance.
   b. If requested, prepare an explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
   c. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
   d. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
2. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 21 days after such authorization.
   a. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
   b. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

H. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
2. For any change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.

I. Substantiation of Costs: Provide full information required for evaluation.
1. Provide following data:
   a. Quantities of products, labor, and equipment.
   b. Taxes, insurance, and bonds.
   c. Overhead and profit.
   d. Justification for any change in Contract Time.
   e. Credit for deletions from Contract, similarly documented.

2. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

J. Execution of Change Orders: On Owner's approval of Proposal Request, ITC, or Contractor's Proposal, Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

K. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

L. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

M. Promptly enter changes in Project Record Documents.

1.06 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Construction Change Directive contains a complete description of changes in the Work. It also designates a method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 23 00
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

1.02 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

1.03 SCHEDULE OF ALTERNATES

A. Alternate No. 1 -ADD Alternate 2" Water Service Extension– Lump Sum – 2” Water Service Extension to Proposed Yard Hydrants for Baseball and Softbal.:
   1. Provide ADD cost to base bid.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. The burden of proof is on the proposer.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.

D. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into a single document.

3.02 SUBSTITUTION PROCEDURES DURING CONSTRUCTION (AFTER BIDDING PHASE)

A. Submittal Form (after award of contract):
   1. Submit substitution requests by completing form provided by Architect. Use only this form; other forms of submission are unacceptable.

B. Architect will consider requests for substitutions only within fifteen (15) days after date of Agreement.

C. Submit request for Substitution for Cause within fourteen (14) days of discovery of need for substitution, but not later than fourteen (14) days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

D. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than fourteen (14) days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
   1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy

conservation, or in other specific ways.

2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
3. Bear the costs engendered by proposed substitution of:
    a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
    b. Other unanticipated project considerations.

E. Substitutions will not be considered under one or more of the following circumstances:
1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Without a separate written request.
3. When acceptance will require revisions to Contract Documents.
4. When there are no Project cost savings or Project time savings associated with the substitution.

3.03 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electronic document submittal service.

B. Release of CAD/BIM files.

C. Preconstruction meeting.

D. Site mobilization meeting.

E. Progress meetings.

F. Construction progress schedule.

G. Coordination drawings.

H. Requests for Information (RFI)

I. Electronic submittal procedures.

J. Submittal procedures.

1.02 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, which depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in the performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
   1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
   2. Contractor and Architect are required to use this service.
   3. It is Contractor's responsibility to submit documents in allowable format.
   4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
   5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
   6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
   7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
      a. Contractor shall upload photos showing samples/manufacturer's label and plan designations as well as provide physical copies as specified in this section.

B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.

C. Submittal Service: Use one of the following:
   1. Submittal Exchange (tel: 1-800-714-0024): www.submittalexchange.com/#sle.
   2. Procore (tel: 1-866-477-6267): www.procore.com.

D. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.

E. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 RELEASE OF CAD/BIM FILES

A. Contractors may request plans for their use/benefit for assistance in preparing submittals or for use in construction.
   1. 2D PDF drawing files of individual sheets may be obtained at no charge to the Contractor.
   2. 2D CAD drawings of individual sheets will be available at a charge per sheet to the Contractor.
   3. A signed Electronic File Transfer release / waiver form is required for all files released to Contractors.
   4. BIM (Models) is not considered a portion of the Contract Documents and release of the design Models in native file format or in translation format will not be provided.

3.03 MEETINGS, GENERAL

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of the date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Entity responsible for conducting meetings will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, and Architect, within three days of the meeting.

3.04 PRECONSTRUCTION MEETING

A. Owner will schedule a meeting after Notice of Award.

B. General Contractor shall schedule and conduct a preconstruction meeting before starting construction, at a time convenient to Owner and Architect, but not later than 15 days after execution of the Agreement.
   1. Conduct the conference to review responsibilities and personnel assignments.
   2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing and long-lead items.
      d. Designation of key personnel and their duties.
      e. Lines of communications.
      f. Procedures for processing field decisions and Change Orders.
      g. Procedures for RFIs.
      h. Procedures for testing and inspecting.
      i. Procedures for processing Applications for Payment.
      j. Distribution of the Contract Documents.
      k. Submittal procedures.
      l. Preparation of record documents.
      m. Use of the premises.
      n. Work restrictions.
      o. Working hours.
      p. Owner's occupancy requirements.
      q. Responsibility for temporary facilities and controls.
      r. Procedures for moisture and mold control.
      s. Procedures for disruptions and shutdowns.
      t. Construction waste management and recycling.
      u. Parking availability.
      v. Office, work, and storage areas.
      w. Equipment deliveries and priorities.
      x. First aid.
      y. Security.
      z. Progress cleaning.

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

3.05 SITE MOBILIZATION MEETING

A. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Contractor's superintendent.
   5. Major Subcontractors.

B. Agenda:
   1. Use of premises by Owner and Contractor.
   2. Owner's requirements.

3. Temporary utilities provided by Owner.
4. Security and housekeeping procedures.
5. Waste Management Plan.
6. Schedules.
7. Application for payment procedures.
8. Procedures for testing.
9. Procedures for maintaining record documents.
10. Requirements for start-up of equipment.
11. Inspection and acceptance of equipment put into service during construction period.

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

3.06 LEED COORDINATION MEETING

A. LEED Coordination Conference: Schedule a LEED coordination conference before starting construction, at a time convenient to Owner, Architect, and Contractor.
   1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent and LEED coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Discuss items of significance that could affect meeting requirements for LEED certification, including the following:
      a. LEED Project Checklist.
      b. General requirements for LEED-related procurement and documentation.
      c. Project closeout requirements and LEED certification procedures.
      d. Role of LEED coordinator.
      e. Construction waste management.
      f. Construction operations and LEED requirements and restrictions.
   3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

3.07 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at weekly intervals.

B. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting. All participants at the meeting shall be familiar with Project and authorized to conclude matters regarding the Work.

C. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project and as follows:
   1. Review minutes of previous meetings.
   2. Review of work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Status of LEED documentation.
   7. Quality and work standards.
   8. Status of RFI's.
   9. Status of proposal requests.
   10. Pending changes,
   11. Status of Change Orders.
   12. Maintenance of progress schedule.
   13. Corrective measures to regain projected schedules.
   14. Planned progress during succeeding work period.
   15. Coordination of projected progress.
   16. Maintenance of quality and work standards.

17. Effect of proposed changes on progress schedule and coordination.
18. Other business relating to work.

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

3.08 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 32 16

A. Within ten (10) days after date of the Agreement, submit preliminary schedule defining planned operations for the first sixty (60) days of work, with a general outline for remainder of work.

B. Submit an updated schedule with each Application for Payment.

3.09 COORDINATION DRAWINGS

A. Provide information required for preparation of coordination drawings. Complete information on a single drawing illustrating the following proposed materials and mounting heights:
1. Architectural walls and ceiling materials. Identify ceiling heights.
2. Structural framing and other structural elements above the proposed ceiling line. Identify sizes of structural members. Identify the bottom of structure.
3. Mechanical ductwork (two-line diagrams) and equipment. Identify size of ductwork and equipment. Identify top and bottom of ductwork and equipment.
4. Plumbing supply and drain lines. Identify size of plumbing lines. Identify bottom of piping. Identify top and bottom of piping at crossovers with other elements.
5. Fire protection piping lines. Identify size of plumbing lines. Identify bottom of piping. Identify top and bottom of piping at crossovers with other elements.
6. Electrical equipment mounted above the ceiling. Identify the top and bottom side of equipment.
7. Locations of recessed light fixtures. Identify the top of fixture.
8. Identify the top and bottom side of equipment.
9. Data cable trays and equipment mounted above the ceiling. Identify bottom of cable trays.
10. Identify access panels necessary for equipment access or maintainance.
11. Identify other elements requiring above ceiling coordination.

B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:
   a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
   b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
   c. Fire-rated enclosures around ductwork.
7. Electrical Work: Show the following:
   a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.

b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Fire-Protection System: Show the following:
   a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

C. Review drawings prior to submission to Architect.

D. Architect Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will inform Contractor, who shall make changes as directed and resubmit.

3.10 REQUESTS FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716 or other form acceptable to or provided by Architect.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for approval of Contractor's means and methods.
   d. Requests for coordination information already indicated in the Contract Documents.
   e. Requests for adjustments in the Contract Time or the Contract Sum.
   f. Requests for interpretation of Architect's actions on submittals.
   g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit a change proposal.
    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

3.11 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
1. Product data.
2. Shop drawings.
3. Samples for selection.
4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.12 SUBMITTALS FOR INFORMATION

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

C. When the following are specified in individual sections, submit them for information:
1. Design data.

2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

D. Submit for Architect's knowledge as contract administrator or for Owner.

3.13 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. Submit for Owner's benefit during and after project completion.

3.14 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Submit submittals electronically via electronic submittal service as PDF electronic files.
   2. Certificates and Certifications Submittals: Provide a statement that includes the signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
      a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
      b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:
      a. Manufacturer's catalog cuts.
      b. Manufacturer's product specifications.
      c. Standard color charts.
      d. Statement of compliance with specified referenced standards.
      e. Testing by recognized testing agency.
      f. Application of testing agency labels and seals.
      g. Notation of coordination requirements.
      h. Availability and delivery time information.
   4. For equipment, include the following in addition to the above, as applicable:
      a. Wiring diagrams showing factory-installed wiring.
      b. Printed performance curves.
      c. Operational range diagrams.
      d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
   5. Submit Product Data before or concurrent with Samples.
   6. Submit Product Data in the following format:
      a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
   1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
      a. Identification of products.

b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:
   a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.
   e. Specification paragraph number and generic name of each item.
3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine the final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Submit three sets of Samples. Architect will retain two sample sets; remainder will be returned.
      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the

following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in the following format:
    a. PDF electronic file.

F. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

G. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

H. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

I. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

J. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

K. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

L. Material Test Reports: Submit reports written by a qualified testing agency, on the testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

M. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

N. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

O. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

P. Compatibility Test Reports: Submit reports written by a qualified testing agency, on the testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

Q. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

R. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

3.15 ADDITIONAL SUBMITTAL PROCEDURES

A. General Requirements:
   1. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   2. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   3. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
   4. Deliver each submittal on the date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
      a. Upload submittals in electronic form to Electronic Document Submittal Service website.
   5. Schedule submittals to expedite the Project, and coordinate submission of related items.
   6. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   7. Provide space for Contractor and Architect review stamps.
   8. When revised for resubmission, identify all changes made since previous submission.
   9. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
   10. Submittals not requested will not be recognized or processed.

B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow fifteen (15) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
   3. Resubmittal Review: Allow fifteen (15) days for review of each resubmittal.
   4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow twenty-one (21) days for initial review of each submittal.
   5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow fifteen (15) days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

3.16 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

D. Architect's and consultants' actions on items submitted for review:
   1. Authorizing purchasing, fabrication, delivery, and installation:

a. "Approved".
b. "Approved as Noted.
1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.

2. Not Authorizing fabrication, delivery, and installation:
a. "Revise and Resubmit".
1) Resubmit revised item, with review notations acknowledged and incorporated.
b. "Not Approved".
1) Submit item complying with requirements of Contract Documents.

E. Architect's and consultants' actions on items submitted for information:
1. Items for which no action was taken:
a. "For Record Only" - to notify the Contractor that the submittal has been received for record only.

END OF SECTION

SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

C. Construction reports.

1.02 SUBMITTALS

A. Within ten (10) days after date of Agreement, submit preliminary schedule.

B. Within twenty (20) days after review of preliminary schedule, submit draft of proposed complete schedule for review.

C. Within ten (10) days after joint review, submit complete schedule.

D. Submit an updated schedule with each Application for Payment.

1.03 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

PART 2 PRODUCTS - NOT USED

2.01 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice of Award to date of final completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
   1. Activity Duration: Define activities so no activity is longer than fourteen (14) days, unless specifically allowed by Architect.
   2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than sixty (60) days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
   4. Startup and Testing Time: Include no fewer than fifteen (15) days for startup and testing.
   5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect and Owner's administrative procedures necessary for certification of Substantial Completion.
   6. Punch List and Final Completion: Include not more than thirty (30) days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Phasing: Arrange list of activities on schedule by phase.
   2. Work under More Than One Contract: Include a separate activity for each contract.
   3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
   4. Work Restrictions: Show the effect of the following items on the schedule:
      a. Coordination with existing construction.
      b. Limitations of continued occupancies.
      c. Uninterruptible services.
      d. Partial occupancy before Substantial Completion.

e. Use of premises restrictions.
f. Provisions for future construction.
g. Seasonal variations.
h. Environmental control.

5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
   a. Subcontract awards.
   b. Submittals.
   c. Purchases.
   d. Mockups.
   e. Fabrication.
   f. Sample testing.
   g. Deliveries.
   h. Installation.
   i. Tests and inspections.
   j. Adjusting.
   k. Curing.
   l. Building flush-out.
   m. Startup and placement into final use and operation.
6. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
   a. Structural completion.
   b. Temporary enclosure and space conditioning.
   c. Permanent space enclosure.
   d. Completion of mechanical installation.
   e. Completion of electrical installation.
   f. Substantial Completion.
7. Other Constraints: Insert constraints not indicated elsewhere.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
   1. Temporary enclosure and space conditioning.

E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
   1. Unresolved issues.
   2. Unanswered Requests for Information.
   3. Rejected or unreturned submittals.
   4. Notations on returned submittals.
   5. Pending modifications affecting the Work and Contract Time.

G. Recovery Schedule: When periodic update indicates the Work is fourteen (14) or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.02 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   1. List of subcontractors at Project site.

2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Identify work of separate stages and other logically grouped activities.

D. Provide sub-schedules for each phase of Work identified in the Phasing Drawings.

E. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

F. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within ten (10) days.

3.05 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

3.06 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Contractor's daily reports.

B. Progress photographs.

C. Submittals for review, information, and project closeout.

1.02 RELATED REQUIREMENTS

A. Section 01 31 00 - Project Management & Coordination: Electronic document and submittal service.

B. Section 01 32 16 - Construction Progress Schedule: Form, content, and administration of schedules.

1.03 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, which depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
   1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's construction schedule.
   2. Preparation of the schedule of values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Preinstallation conferences.
   7. Project closeout activities.
   8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
   1. Salvage materials and equipment involved inbthe performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 MEETINGS, GENERAL

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting the dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meetings will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, and Architect, within three days of the meeting.

3.02 PRECONSTRUCTION MEETING

A. Owner will schedule a meeting after Notice of Award.

B. General Contractor shall schedule and conduct a preconstruction meeting before starting construction, at a time convenient to Owner and Architect, but not later than fiftenn (15) days after execution of the Agreement.
   1. Conduct the conference to review responsibilities and personnel assignments.
   2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing and long-lead items.
      d. Mobiliation and staging time/location.
      e. Designation of key personnel and their duties.
      f. Lines of communications.
      g. Procedures for processing field decisions and Change Orders.
      h. Procedures for RFIs.
      i. Procedures for testing and inspecting.
      j. Procedures for processing Applications for Payment.
      k. Distribution of the Contract Documents.
      l. Submittal procedures.
      m. Preparation of record documents.
      n. Use of the premises.
      o. Work restrictions.
      p. Working hours.
      q. Owner's occupancy requirements.
      r. Responsibility for temporary facilities and controls.
      s. Procedures for moisture and mold control.
      t. Procedures for disruptions and shutdowns.
      u. Construction waste management and recycling.
      v. Parking availability.
      w. Office, work, and storage areas.
      x. Equipment deliveries and priorities.
      y. First aid.
      z. Security.
      aa. Progress cleaning.

C. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.
   4. Mechanical Engineer.

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

3.03 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at bi-monthly intervals.

B. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, Engineer as appropriate to agenda topics for each meeting. All participants at the meeting shall be familiar with Project and authorized to conclude matters regarding the Work.

C. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project and as follows:
   1. Review minutes of previous meetings.
   2. Review of work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Quality and work standards.
   7. Status of RFI's.
   8. Status of proposal requests.
   9. Pending changes,
   10. Status of Change Orders.
   11. Maintenance of progress schedule.
   12. Corrective measures to regain projected schedules.
   13. Planned progress during succeeding work period.
   14. Coordination of projected progress.
   15. Maintenance of quality and work standards.
   16. Effect of proposed changes on progress schedule and coordination.
   17. Other business relating to work.

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

3.04 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 32 16

A. Within ten (10) days after date of the Agreement, submit preliminary schedule defining planned operations for the first sixty (60) days of work, with a general outline for remainder of work.

B. Submit an updated schedule with each Application for Payment.

3.05 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
   1. Date.
   2. High and low temperatures, and general weather conditions.
   3. List of subcontractors at Project site.
   4. List of separate contractors at Project site.
   5. Approximate count of personnel at Project site.
      a. Include a breakdown for supervisors, laborers, journeymen, equipment operators, and helpers.
   6. Safety, environmental, or industrial relations incidents.
   7. Meetings and significant decisions.
   8. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
   9. Testing and/or inspections performed.
   10. Signature of Contractor's authorized representative.

3.06 PROGRESS PHOTOGRAPHS

A. Submit photographs with each application for payment, taken not more than three (3) prior to submission of application for payment.

B. Photography Type: Digital; electronic files.

C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.

D. In addition to periodic, recurring views, take photographs of each of the following events:

E. Views:
   1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
   2. Consult with Architect for instructions on views required.
   3. Provide factual presentation.
   4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

F. Digital Photographs: 24-bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
   1. Delivery Medium: Via email.
   2. File Naming: Include project identification, date and time of view, and view identification.
   3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
   4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.07 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
   1. Submit at the same time as the preliminary schedule specified in Section - 01 32 16 - Construction Progress Schedule.
   2. Coordinate with Contractor's construction schedule and schedule of values.

3.08 REQUESTS FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
   1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
   2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
   1. Project name.
   2. Project number.
   3. Date.
   4. Name of Contractor.
   5. Name of Architect.
   6. RFI number, numbered sequentially.
   7. RFI subject.
   8. Specification Section number and title and related paragraphs, as appropriate.
   9. Drawing number and detail references, as appropriate.
   10. Field dimensions and conditions, as appropriate.
   11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
   12. Contractor's signature.
   13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
      a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716 or other form acceptable to Architect.
   1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
   1. The following Contractor-generated RFIs will be returned without action:
      a. Requests for approval of submittals.
      b. Requests for approval of substitutions.
      c. Requests for approval of Contractor's means and methods.
      d. Requests for coordination information already indicated in the Contract Documents.
      e. Requests for adjustments in the Contract Time or the Contract Sum.
      f. Requests for interpretation of Architect's actions on submittals.
      g. Incomplete RFIs or inaccurately prepared RFIs.
   2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
   3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
      a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within ten (10)days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
   1. Project name.
   2. Name and address of Contractor.
   3. Name and address of Architect.
   4. RFI number including RFIs that were returned without action or withdrawn.
   5. RFI description.
   6. Date the RFI was submitted.
   7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
   1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
   2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

3.09 RELEASE OF CAD/BIM FILES

A. Contractors may request plans for their use/benefit for assistance in preparing submittals or for use in construction.
   1. 2D PDF drawing files of individual sheets may be obtained at no charge to the Contractor.
   2. 2D CAD drawings of individual sheets will be available at a charge per sheet to the Contractor
   3. A signed Electronic File Transfer release / waiver form is required for all files released to Contractors.
   4. BIM (Models) is not considered a portion of the Contract Documents and release of the design Models in native file format or in translation format will not be provided.

3.10 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below.

3.11 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. Submit for Owner's benefit during and after project completion.

3.13 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Submit electronic submittals via email as PDF electronic files.
   2. Certificates and Certifications Submittals: Provide a statement that includes the signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
      a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
      b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:
      a. Manufacturer's catalog cuts.
      b. Manufacturer's product specifications.
      c. Standard color charts.
      d. Statement of compliance with specified referenced standards.
      e. Testing by recognized testing agency.
      f. Application of testing agency labels and seals.
      g. Notation of coordination requirements.
      h. Availability and delivery time information.
   4. For equipment, include the following in addition to the above, as applicable:
      a. Wiring diagrams showing factory-installed wiring.
      b. Printed performance curves.
      c. Operational range diagrams.
      d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
   5. Submit Product Data before or concurrent with Samples.
   6. Submit Product Data in the following format:

a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
   1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
      a. Identification of products.
      b. Schedules.
      c. Compliance with specified standards.
      d. Notation of coordination requirements.
      e. Notation of dimensions established by field measurement.
      f. Relationship and attachment to adjoining construction clearly indicated.
      g. Seal and signature of professional engineer if specified.
   2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
   3. Submit Shop Drawings in the following format:
      a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
   1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
   2. Identification: Attach label on unexposed side of Samples that includes the following:
      a. Generic description of Sample.
      b. Product name and name of manufacturer.
      c. Sample source.
      d. Number and title of applicable Specification Section.
      e. Specification paragraph number and generic name of each item.
   3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
   4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine the final acceptance of construction associated with each set.
      a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
      b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
   5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
      a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
   6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
      a. Number of Samples: Submit three sets of Samples. Architect will retain twoSample sets; the remainder will be returned.
         1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be

demonstrated.

2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
   1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
   2. Manufacturer and product name, and model number if applicable.
   3. Number and name of room or space.
   4. Location within room or space.
   5. Submit product schedule in the following format:
      a. PDF electronic file.

F. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

G. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

H. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

I. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

J. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

K. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

L. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

M. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

N. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
   1. Name of evaluation organization.
   2. Date of evaluation.
   3. Time period when report is in effect.
   4. Product and manufacturers' names.
   5. Description of product.
   6. Test procedures and results.
   7. Limitations of use.

O. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

P. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

Q. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

R. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

3.14 ADDITIONAL SUBMITTAL PROCEDURES

A. General Requirements:
   1. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   2. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   3. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
   4. Deliver each submittal on the date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
      a. Upload submittals in electronic form to Electronic Document Submittal Service website.
   5. Schedule submittals to expedite the Project, and coordinate submission of related items.
   6. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   7. Provide space for Contractor and Architect review stamps.
   8. When revised for resubmission, identify all changes made since previous submission.
   9. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
   10. Submittals not requested will not be recognized or processed.

B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow fifteen (15) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
   3. Resubmittal Review: Allow fifteen (15) days for review of each resubmittal.
   4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow twenty-one (21) days for initial review of each submittal.
   5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow fifteen (15) days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

3.15 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

D. Architect's and consultants' actions on items submitted for review:
   1. Authorizing purchasing, fabrication, delivery, and installation:
      a. "Approved", or language with same legal meaning.
      b. "Approved as Noted", or language with same legal meaning.
         1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
   2. Not Authorizing fabrication, delivery, and installation:
      a. "Revise and Resubmit".
         1) Resubmit revised item, with review notations acknowledged and incorporated.
         2) Non-responsive resubmittals may be rejected.
      b. "Not Approved".
         1) Submit item complying with requirements of Contract Documents.

E. Architect's and consultants' actions on items submitted for information:
   1. Items for which no action was taken:
      a. "For Record Only" - to notify Contractor that the submittal has been received for record only.

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. References and standards.

C. Testing and inspection agencies and services.

D. Control of installation.

E. Tolerances.

F. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Section 01 42 16 - Definitions.

1.03 SUBMITTALS

A. Test Reports: After each test/inspection, promptly submit two (2) copies of report to Architect and Owner.

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

1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

D. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.

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

1.04 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

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

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform specified testing and inspections.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged

to perform.

2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

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

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

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

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

E. Have work performed by persons qualified to produce required and specified quality.

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

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TOLERANCES

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

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

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

3.03 TESTING AND INSPECTION

A. See individual specification sections for testing required.

B. Testing Agency Duties:

1. Provide qualified personnel on site. Cooperate with Architect and Owner in performance of services.
2. Perform specified sampling and testing of products in accordance with specified standards.
3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
4. Promptly notify Architect and Owner of observed irregularities or non-compliance of Work or products.
5. Perform additional tests and inspections required by Architect.
6. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:

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

D. Contractor Responsibilities:

1. Cooperate with laboratory personnel, and provide access to the Work.
2. Provide incidental labor and facilities:

a. To provide access to Work to be tested/inspected.
b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
c. To facilitate tests/inspections.
d. To provide storage and curing of test samples.

3. Notify Architect, Owner and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
4. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Owner and Architect beyond specified requirements.
5. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.04 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

3.05 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

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SECTION 01 41 00
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY OF REFERENCE STANDARDS

A. Regulatory requirements applicable to this project include but are not limited to the following:

B. 29 CFR 1910 - Occupational Safety and Health Standards; current edition.

C. 40 CFR 60 – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines..

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01 42 16
DEFINITIONS

PART 1 GENERAL

1.01 SUMMARY

A. This section supplements the definitions contained in the General Conditions.

B. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

A. Approved: When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

B. Directed: A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed".

C. Furnish: To supply, deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operation.

D. Indicated: Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. Install: To unload, temporarily store, unpack, assemble, erect, apply, place, anchor, work to dimensions, finish, cure, protect, clean, start up, and make ready for use.

F. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

G. Project Site: Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

H. Provide: To furnish and install, complete and ready for the intended use.

I. Regulations: Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

J. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

D. Vehicular access and parking.

E. Waste removal facilities and services.

F. Project identification sign.

G. Field offices.

1.02 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of Environmental Protection Agency (EPA) Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
   1. Describe delivery, handling and storage provisions for materials subject to water absorption or water damage.
   2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
   3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show proceedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
   1. Locations of dust-control partitions at each phase of work.
   2. HVAC system isolation schematic drawing.
   3. Location of proposed air-filtration system discharge.
   4. Waste handling proceedures.
   5. Other dust-control measures.

1.03 TEMPORARY UTILITIES

A. Owner will provide the following:
   1. Electrical power, consisting of connection to existing facilities.
   2. Water supply, consisting of connection to existing facilities.
   3. Sewer service, consiting of connection to existing facilities.

B. Provide and pay for all heating and cooling and ventilation required for construction purposes.
   1. Do not use Owner's electrical power for heating, cooling and ventilation during construction.

C. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.04 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

B. Telecommunications services shall include:
   1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
   2. Internet Connections: Minimum of one; DSL modem or faster.
   3. Email: Account/address reserved for project use.

1.05 TEMPORARY SANITARY FACILITIES

A. Use of existing facilities is permitted.

B. Maintain daily in clean and sanitary condition.

C. At end of construction, return facilities to same or better condition as originally found.

1.06 EXTERIOR ENCLOSURES

A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.07 INTERIOR ENCLOSURES

A. Provide temporary partitions as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

1.08 VEHICULAR ACCESS AND PARKING

A. Coordinate access and haul routes with governing authorities and Owner.

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

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Existing parking areas may be used for construction parking.

1.09 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Project shall generate the least amount of trash and waste possible.

C. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

D. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

E. Provide containers with lids. Remove trash from site periodically.

F. Recycle or Salvage as much waste as possible, including, but not limited to:
   1. Aluminum and plastic beverage containers.
   2. Corrugated cardboard.
   3. Wood pallets.
   4. Clean dimensional wood.
   5. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping,
   6. reinforcing bars, door frames, and other items made of steel, iron, galvanized steel,
   7. stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
   8. Glass.
   9. Gypsum drywall and plaster.
   10. Plastic buckets.
   11. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (http://flooring.dupont.com) and Interface (www.interfaceinc.com) conduct reclamation programs.

12. Fluorescent lamps (light bulbs).
13. Acoustical ceiling tile and panels.

G. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

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

1.10 PROJECT IDENTIFICATION

A. Provide project identification sign of design and construction indicated on drawings.

B. Erect on site at location indicated.

C. No other signs are allowed without Owner permission except those required by law.

1.11 FIELD OFFICES

A. Field Office: Prefabricated or mobile units, weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rackand drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate ten (10) persons.

C. Locate offices a minimum distance of thirty (30) feet from existing and new structures.

1.12 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

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

B. Remove underground installations to a minimum depth of two (2) feet. Grade site as indicated.

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

D. Restore existing facilities used during construction to original condition.

PART 2 PRODUCTS - NOT USED

2.01 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposure.

PART 3 EXECUTION - NOT USED

3.01 INSTALLATION, GENERAL

A. Locate facilites where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company, Owner and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

C. Sanitary Facilities: Provide temporary toilets, wash facilites, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

D. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

E. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
   1. Connect temporary service to Owner's existing power source, as directed by Owner.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnnel. Install one telphone line for each field office.
   1. At each telephone, post a list of important telephone numbers:
      a. Police and fire departments.
      b. Ambulance service.
      c. Contractor's home office.
      d. Contractor's emergency after-hours telephone number.
      e. Architect's office.
      f. Engineer's office.
      g. Owner's office.
      h. Principal subcontractors' field and home offices.
   2. Provide superintendent with cellular telephone when away from field office.

J. Electronic Communication Service: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications. Equip computer with not less than the following:
   1. Processor: Intel Pentium D or Intel CoreDuo, 3.0 GHz processing speed.
   2. Memory: 4 gigabytes.
   3. Disk Storage: 300 gigabyte hard-disk drive and combination DVD-RW/CD-RW drive.
   4. Display: 22-inch LCD monitor with 256-Mb dedicated video RAM.
   5. Full-size keyboard and mouse.
   6. Network Connectivity: 10/100BaseT Ethernet.
   7. Operating System: Microsoft Windows XP Professional or Microsoft Windows 7x32 Business.
   8. Productivity Software:
      a. Microsoft Office Professional, 2003 or higher, including Word, Excel, and Outlook.
      b. Adobe Reader 9.0 or higher.
      c. WinZip 7.0 or higher.
   9. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions.
   10. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum 384 Kbps upload and 1.5 Mbps download speeds at each computer.
   11. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.
   12. Backup: External hard drive, minimum 500 gigabyte, with automated backup software providing daily backups.

3.03 SUPPORT FACILITIES INSTALLATION

A. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in the same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

C. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
   1. Dispose of rainwater in lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilites.
   2. Remove snow and ice as required to minimize accumulations.

D. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
   1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.04 SECURITY AND PROTECTION OF FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Temporary Erosion and Sedimentation Control: Comply with requirements specified.

D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering the site except by entrance gates.

F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

G. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

H. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate occupied areas from fumes and noise.

I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

J. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

END OF SECTION

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SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations.

E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

1.03 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchases for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, which is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Products: Product that is demonstrated and approved, prior to bid, through substitution process, to have qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that are equal to or exceed those of the specified products.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.04 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

2.02 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

2.03 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurerent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated from properly executed.
   3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

PART 3 EXECUTION

3.01 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
   3. Where products are accompanied by the term "as selected," Architect will make selection.
   4. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:
   1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutieons for Contractor's convenience will not be considered unless approved by the Architect prior to bid.
   2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   3. Basis-of Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product, that meets or exceeds the characteristics of the basis-of-design product, by one of the other named manufacturers. Drawings and specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Designation as an acceptable comparable manufacturer does not signify acceptance of a specific product by that manufacturer unless it is deemed, by the Architect, as meeting or exceeding the characteristics of the basis-of-design product.
      a. Construction Document design is based on the basis-of-design product listed, if a comparable product from another named manufacturer is proposed, the Architect shall consider the Contractor's selection of a comparable product when the following conditions are satisfied. If all of the following conditions are not satisfied, Architect will return requests without action, except to record non-compliance with these requirements:
         1) Selected comparable product must be from one of the manufacturer's listed as an acceptable manufacturer in the specifications.

2) Evidence that the selected comparable product does not require extensive revisions to the Contract Documents and will produce the indicated results, and that it is compatible with other portions of work.
3) Detailed comparison of significant qualities of proposed comparable product with the basis-of-design product named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
4) Evidence that comparable product provides warranty which meets or exceeds that specified.
5) List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
6) Samples, if requested.

b. Products by unnamed manufacturers will only be considered prior to bid. Comply with "Comparable Product Requests" paragraphs for consideration of comparable products.
c. Where a list of manufacturers is not provided, comply with "Comparable Product Requests" paragraphs for consideration of comparable products. Comparable product request will only be considered prior to bid.

C. Visual Matching Specification: Where Specifications require "match Architect's sample" provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

3.02 SUBSTITUTION LIMITATIONS

A. See Section 01 25 00 - Substitution Procedures.

B. Submit substitution request on Substitution Request Form provided in the Specification Manual.
1. Notification of approved substitutions shall be provided by Addendum.
2. Use product specified if Architect does not issue a decision on use of a substitution request within time allocated.

3.03 COMPARABLE PRODUCT REQUESTS

A. Submit request for consideration of each comparable product during the bidding period complying with same time restrition as substitutions, using same form as substitution requests. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within three days of receipt of request.
2. Notification of approved substitutions shall be provided by Addendum.
3. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

3.04 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on the outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage, deterioration, and loss, including theft and vandalism to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

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

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.05 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable tothe product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

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

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

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

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Cutting and patching.

D. Laying out the Work.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of Owner personnel.

H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

I. General requirements for maintenance service.

1.02 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.
   6. Include in request:
      a. Extent: Describe reason for and extent of each occurrence of cutting and patching.
      b. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well other significant visual elements.
      c. Products: List products to be used for patching and firms or entities that will perform patching work.
      d. Dates: Indicate when cutting and patching will be performed.
      e. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
         1) Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.04 QUALIFICATIONS

A. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

1.05 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Mechanical systems piping and ducts.
    f. Control systems.
    g. Communication systems.
    h. Fire-detection and -alarm systems.
    i. Conveying systems.
    j. Electrical wiring systems.
    k. Operating systems of special construction.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, which results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
    a. Water, moisture, or vapor barriers.
    b. Membranes and flashings.
    c. Exterior curtain-wall construction.
    d. Sprayed fire-resistive material.
    e. Equipment supports.
    f. Piping, ductwork, vessels, and equipment.
    g. Noise- and vibration-control elements and systems.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.06 PROJECT CONDITIONS

A. Use of explosives is not permitted.

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

C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
    1. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

D. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

E. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

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

B. Notify affected utility companies and comply with their requirements.

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

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

E. Coordinate completion and clean-up of work of separate sections.

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

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

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

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

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

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

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

G. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

H. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Existing Utility Information: Furnish information to Owner, Architect, and the relevant public authority that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Clean substrate surfaces prior to applying the next material or substance.

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

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

3.03 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. Establish a minimum of two (2) permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

C. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

D. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, which are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

E. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

F. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

G. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

H. Make neat transitions between different surfaces, maintaining texture and appearance.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.05 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

C. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new

construction.

E. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.

F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

H. Refinish existing surfaces as indicated:
   1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
   2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

I. Clean existing systems and equipment.

J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

3.06 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-complying work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

F. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

G. Temporary Support: Provide temporary support of work to be cut.

H. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

I. Cut rigid materials using masonry saw or core drill. Pneumatic tools are not allowed without prior approval.

J. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with

minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

K. Restore work with new products in accordance with requirements of Contract Documents.

L. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

M. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material, to full thickness of the penetrated element.

N. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
2. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
3. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
4. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
5. Match color, texture, and appearance.
6. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

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

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

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

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

G. Prohibit traffic from landscaped areas.

H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.08 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold waste materials for more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
      a. Use containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.
   1. Mow grass and weed growth areas to keep groth maintained.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.09 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.

B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.12 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Sweep concrete floors broom clean in unoccupied spaces.
    i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
    j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    k. Remove labels that are not permanent.
    l. Wipe surfaces of mechanical and electrical equipment[, elevator equipment,] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
    p. Leave Project clean and ready for occupancy.

C. Use cleaning materials that are nonhazardous.

D. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft

surfaces.

E. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

F. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

G. Clean filters of operating equipment.

H. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

I. Clean site; sweep paved areas, rake clean landscaped surfaces.

J. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

A. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

B. Substantial Completion Procedures
   1. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
   2. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
      a. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
      b. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
      c. Submit closeout submittals specified in individual Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
      d. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
         1) Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section.
      e. Submit test/adjust/balance records.
      f. Submit sustainable design submittals required in Division 01 sustainable design requirements Section and in individual Division 02 through 33 Sections.
      g. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
   3. Procedures Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
      a. Advise Owner of pending insurance changeover requirements.
      b. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
      c. Complete startup and testing of systems and equipment.
      d. Perform preventive maintenance on equipment used prior to Substantial Completion.

e. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."
f. Advise Owner of changeover in heat and other utilities.
g. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
h. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
i. Complete final cleaning requirements, including touchup painting.
j. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

4. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of ten (10) days prior to the date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect's punch list, which must be completed or corrected before certificate will be issued.
   a. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
   b. Results of completed inspection will form the basis of requirements for final completion.

C. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submitted to Architect.

D. Final Completion Procedures:
1. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
   a. Submit a final Application for Payment according to Division 01 Section "Price and Payment Procedures."
   b. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   c. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
   d. Submit pest-control final inspection report and warranty.
   e. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
2. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
   a. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

E. List of Incomplete Items (Punch List)
1. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
   a. Organize list of spaces in sequential order.
   b. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3.14 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
   1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
   2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
      a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
   3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
   4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

3.15 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

E. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse construction waste material in some manner on the project site.

K. Salvage: To remove waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS

A. Submit Waste Management Plan within ten (10) calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner; submit projection of all trash and waste that will require disposal and alternatives to landfilling.

B. Waste Management Plan: Include the following information:
   1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
   2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
   3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
   4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
   5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
   6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e., whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

C. Cost/Revenue Analysis: Indicate total cost of waste disposal os if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan, include the following:
   1. Total quantity of waste.
   2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
   3. Total cost of disposal (with no waste management).
   4. Revenue from salvaged materials.
   5. Revenue from recycled materials.
   6. Savings in hauling and tipping fees by donating material.
   7. Savings in hauling and tipping fees that are avoided.
   8. Handling and transportation cost. Include cost of collection containers for each type of waste.
   9. Net additional cost or net savings from waste management plan.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PLAN IMPLEMENTATION

A. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occuring at Project site.

B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Designate and label specific areas on Project Site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

3.02 RECYCLING, DEMOLITION AND CONSTRUCTION WASTE MANAGEMENT

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include a list of acceptable and unacceptable materials at each container and bin.
    a. Inspect containers and bins for contamination and remove contaminated materials if found.
    b. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
    c. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
    d. Store components off the ground and protect from the weather.
    e. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.03 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
    1. Preconstruction meeting.
    2. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
    1. Provide containers as required.
        a. Separate dumpsters for each category of recyclable, unless materials are to be separated off-site.
    2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
    3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

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SECTION 01 76 10
TEMPORARY PROTECTIVE COVERINGS

PART 2 PRODUCTS

1.01 GENERAL

A. Provide materials that are easily removed without damage to the surfaces covered and with the following characteristics:
   1. Water resistant.
   2. Vapor permeable.
   3. Impact resistant.
   4. Slip resistant.
   5. Flame retardant.

PART 3 EXECUTION

2.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

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SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Individual Product Sections: Specific requirements for operation and maintenance data.

C. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two (2) copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one (1) copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten (10) days after acceptance.
   3. Submit one (1) copy of completed documents fifteen (15) days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit a set of revised final documents in final form within ten (10) days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten (10) days after acceptance.
   2. Make other submittals within ten (10) days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten (10) days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one (1) set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.

B. Record Prints:
   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:
a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or ConstructionChange Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

C. Ensure entries are complete and accurate, enabling future reference by Owner.

D. Store record documents separate from documents used for construction.

E. Record information concurrent with construction progress.

F. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
1. Product data, with catalog number, size, composition, and color and texture designations.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and

recommended schedule for cleaning and maintenance.

C. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and any special operating instructions.

D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

E. Provide servicing and lubrication schedule, and list of lubricants required.

F. Include manufacturer's printed operation and maintenance instructions.

G. Include sequence of operation by controls manufacturer.

H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

I. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Operation and Maintenance Manual Electronic File: Assemble complete operation and maintenance manual submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

C. Where systems involve more than one (1) specification section, provide separate linked dividers for each system.

D. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item using the same identification as on the divider tabs; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.

2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
    a. Significant design criteria.
    b. List of equipment.
    c. Parts list for each component.
    d. Operating instructions.
    e. Maintenance instructions for equipment and systems.
    f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
3. Part 3: Project documents and certificates, including the following:
    a. Shop drawings and product data.
    b. Photocopies of warranties and bonds.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten (10) days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11-inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

I. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

END OF SECTION

SECTION 029000 - PLANTING

1. GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Planting of drought tolerant trees, shrubs, sod, seed, groundcover, and associated materials.

B. Related Sections
   1. Grading and Erosion and Sedimentation Control requirements as given on the construction drawings.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. American National Standards Institute (ANSI)
   1. ANSI Z60.1 - American Standard for Nursery Stock.

C. ASTM International
   1. ASTM D5268 - Topsoil used for Landscaping Purposes.
   2. ASTM C602 - Agricultural Liming Materials.

D. Erosion Control Technology Council (ECTC)
   1. Standard Specification for Rolled Erosion Control Products.

1.3 SUBMITTALS

A. Submittal Process: Submit in accordance with Section 013223 – Shop Drawings, Product Data, and Samples.

B. Submittals shall be available at all times to the Owner/Construction Manager.

C. Grower / Nursery Information: Submit name, address, phone number and contact person for each Grower / Nursery 30 days prior to plant material selection meeting.

D. Materials Test Reports: Submit to Owner’s Construction Manager
   1. Provide location of topsoil borrow area.
   2. Provide name of independent soil testing laboratory.
   3. Provide date of sampling and testing.

E. Product Data:
   1. Submit certification tags from trees, shrubs, sod, and seed verifying type and purity to Owner's Construction Manager.
   2. Submit photographs of each species of tree specified. Photographs shall be taken at grower's nursery prior to digging. Photographs shall contain tree with measuring rod in vertical position 30 days prior to plant material selection meeting.

F. Quality Assurance Submittals:
   1. Submit to Owner and/or Architect a copy of the invoice for each shipment of plant materials to the Project site. Invoice shall include name and size of each type of plant material.
   2. Tree Transplanting Contractor Qualifications:
      a. Provide statement of required qualifications of tree transplanting contractor.
      b. Provide Owner project names, addresses, project owner's names and phone numbers for completed projects of similar scope.
      c. Provide progress photographs of the tree transplanting process and final photographs taken at least 2 years after establishment.
      d. Provide evidence of the health of at least 10 trees transplanted 3 or more years ago on at least 3 different projects. Trees shall be of similar size, species, and conditions of the trees indicated on the Plans.

G. Closeout Submittals:
   1. Certification of Conformance: Provide certificate of satisfactory performance of planting operations signed by the Contractor and Landscape Architect.

1.4 QUALITY ASSURANCE

A. Pre-Work Meeting: Convene a pre-work meeting minimum 30 days prior to commencing work on this Section. Review conditions of operations, procedures and coordination with related work. The pre-work meeting may be combined with the plant material selection trip.
   1. Review planting schedule and maintenance.
   2. Review required inspections, schedule of topsoil testing, and environmental procedures.
   3. A Construction Testing Laboratory (CTL) selected and paid for by the Contractor will be retained to perform testing and analysis on in-place topsoil.
   4. The CTL shall prepare test reports that indicate test location and test results. Civil Engineering Consultant, and Contractor shall be provided with copies of reports as follows:
      a. Topsoil Analysis – within 10 calendar days of sampling date.
      b. Topsoil Depth Inspection – within 3 working days of test completion.
   5. In event that test performed fails to meet Specifications, the (CTL) shall notify Owner and Contractor immediately and record the deviations on the Observation Log.
   6. Contractor shall provide free access to site for testing activities.

B. Plant Material Selection:
   1. Trees: Trees will be tagged by the landscape architect at the tree grower nursery prior to purchase and delivery to site.
   2. Shrubs: Deliver representative samples of each shrub variety and size to the Project site for verification of specification compliance. Mark shrubs with size, genus, species, cultivar, and variety.
   3. Schedule and arrange meeting of landscape contractor and landscape architect for observation of plant material at the tree grower nursery. Tagging and observation will be based on compliance with requirements for genus, species, variety, cultivar, size, and quality.
   4. Owner and landscape architect may observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects.
   5. Remove rejected trees or shrubs immediately from Project site.

C. Plant Measurements: Measure according to ANSI Z60.1. Spread, height, or container sizes shown on the drawings are minimum acceptable sizes. Do not prune to obtain required sizes. If range of sizes is given, no plant shall be less than minimum size, and at least 50 percent of plants shall be as large as upper half of range specified.
   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. Soil-Testing Laboratory Qualifications: An independent soil testing laboratory with the experience and capability to conduct the testing indicated based on local conditions, employing a landscape or soil agronomist familiar with the final use of the material and construction practices for large earthwork sites.

E. Quality Assurance Inspections: Conduct the following inspections during the course of the work in the presence of the Landscape Architect to verify conformance to specification requirements. Notify Owner for observation of inspection by the Landscape Architect. Correct noted deficiencies during each inspection prior to proceeding with subsequent work.
   1. Disturbed Areas: Inspect disturbed areas for excavation depth and soil conditions prior to installation of planting or irrigation. Obtain sample of planting soil mix.
   2. Substantial Completion Inspection: Convene a substantial completion inspection to observe completed work. Landscape Architect will develop a punch list of deficient or incomplete items and deliver to Contractor within 3 calendar days of inspection date.
   3. Final Inspection: Within 30 days of substantial completion date, convene a final inspection to observe that all work is completed as specified and shown on the drawings.

4. Warranty Inspections: Convene a warranty inspection 60 calendars days prior to expiration of warranty period specified in Part 3 herein.

F. Meeting and Inspection Log: Maintain log of required meetings and inspections. Record the date; time; weather conditions; and a brief summary of the Owner or Construction Manager for signature and review by Landscape Architect at the conclusion of each meeting. Furnish copy of log to each party attending.

1.5 MEETING AND EVENT NOTIFICATIONS

A. Provide the following notifications to the Owner's Construction Manager within the time period listed below. Construction Manager will notify Owner, landscape architect, and other necessary sub consultants:
1. Pre-Work Meeting: Minimum 14 calendar days prior to meeting date.
2. Plant Material Selection Meeting at Grower: Minimum 14 calendar days prior to meeting date.
3. Planting Operations: 14 calendar days prior to commencing planting operations.
4. Tree Transplanting: Minimum 7 calendar days in advance for transplanting of trees 8 inches in caliper or greater.
5. Substantial Completion Inspection: 7 calendar days prior to substantial completion date.
6. Final Inspection: 7 calendar days prior project close out.
7. Warranty Inspection: 14 calendar days prior to inspection date.

B. Provide notifications by email or other written means to show proof of delivery.

1.6 PROJECT CONDITIONS

A. Perform work only during weather conditions favorable to landscape construction and to health and welfare of plants. Owner shall determine suitability of such weather conditions.

1.7 WARRANTY

A. Guarantee plant material for a period of 12-19 months following the Substantial Completion Date in accordance with the Warranty Chart included in Part 3 hereinafter.
1. A limit of one replacement of each plant shall be required, except for losses or replacements due to failure to comply with requirements.
2. Remove from site any plant that is dead or unsatisfactory to Owner, Jurisdiction having Authority, or Landscape Architect. Replace plants during normal planting season.

2. PRODUCT

2.1 WOODY PLANT MATERIALS

A. Furnish nursery-grown trees and shrubs complying with ANSI Z60.1 and the following requirements:
   1. Provide plants with healthy root systems developed by transplanting or root pruning.
   2. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as disfiguring knots, sun scald, injuries, abrasions, and disfigurement.
   3. Provide selected specimen quality plants being exceptionally heavy, symmetrical, tight knit, so trained or favored in their development and appearance as to be superior in form, number of branches, compactness and symmetry.
   4. Do not prune plants before delivery.
   5. Trees with fresh cuts of limbs over 1 1/4-inch, which have not completely calloused, shall be rejected.
   6. Provide plants typical of their species or variety and exhibiting a normal habit of growth and be legibly tagged with proper name. Provide plants grown under climatic conditions similar to those of site or have been acclimated to such condition for at least 2 years.
   7. Root system of each plant shall be well-provided with fibrous roots. Parts shall be sound, healthy, vigorous, well-branched, and densely foliated when in leaf.
   8. Plants designated ball and burlap shall be moved with root systems as solid units with balls of earth firmly wrapped with burlap and comply with the following:
      a. Diameter and depth of balls of earth shall be sufficient to encompass fibrous root feeding systems necessary for healthy development of plant.
      b. No plant shall be accepted when ball of earth surrounding its roots has been cracked or broken preparatory to or during process of planting. Balls shall remain intact during all operations.
      c. Heel-in plants that cannot be planted immediately by setting in ground and covering balls with soil or mulch and then watering.
      d. Hemp burlap and twine is preferable to treated. If treated burlap is used, twine shall be cut from around trunk and burlap shall be removed.
   9. Provide single trunk trees growing from single unmutilated crown of roots. No part of trunk shall be conspicuously crooked as compared with normal trees of same variety.
   10. Provide shrubs with thickness corresponding to trade classification "No.1". Single-stemmed or thin plants shall not be accepted. Side branches shall be generous, well-twigged, and plant as whole well-branched to ground. Plants shall be in moist condition, free from dead wood, bruises, or other root or branch injuries.

2.2 LAWN SEED

A. Provide fresh, clean, new crop lawn seed mixture. Furnish to Owner dealers guaranteed statement of composition of mixture and percentage of purity and germination of each variety.

B. Seed Mixture: Provide seed of grass species and varieties, proportions by weight and minimum percentages of purity, germination, and maximum percentage of weed seed. Seed mixtures vary by region and season and shall comply with Illinois DOT and Local Soil Conservation Service Standards for lawn turf.

2.3 TOPSOIL

A. ASTM D5268, natural, friable, fertile, fine loamy soil possessing characteristics of representative topsoil in the vicinity that produces heavy growth. Topsoil shall have a pH range of 5.5 to 7.4 percent, free from subsoil, objectionable weeds, litter, sods, stiff clay, stones larger than 1-inch in diameter, stumps, roots, trash, toxic substances, or any other material which may be harmful to plant growth or hinder planting operations. Top soil shall contain a minimum of three percent organic material.

B. Salvaged or Existing Topsoil: Reuse salvaged topsoil stockpiled on-site or existing topsoil undisturbed by grading or excavation operations. Clean topsoil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

C. Verify amount stockpiled if any, and supply additional imported topsoil as needed.

D. Imported Topsoil: Supplement salvaged topsoil with imported topsoil from off-site sources when existing quantities are insufficient.
   1. Obtain topsoil displaced from naturally well-drained sites where topsoil occurs at least 6 inches deep; do not obtain from agricultural land, bogs, or marshes.
   2. Verify borrow and disposal sites are permitted as required by state and local regulations. Obtain written confirmation that permits are current and active.
   3. Obtain permits required by state and local regulations for transporting topsoil. Permits shall be current and active.

E. Amend topsoil as indicated in part 3 below.

2.4 ORGANIC SOIL AMENDMENTS

A. 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, and material harmful to plant growth.

B. Back to Nature Cotton Burr Compost or approved equivalent.

C. Compost: Decomposed organic material including leaf litter, manure, sawdust, plant trimmings and/or hay, mixed with soil.

D. Pecan Hulls: Composted pecan hulls for local source.

E. Biosolids: Use Grade 1 containing lower pathogen levels.

F. Worm Castings: Earthworms.

2.5 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C602, Class O agricultural limestone containing a minimum of 80 percent calcium carbonate equivalent with a minimum of 95 percent passing No. 8 sieve and minimum of 55 percent passing No. 60 sieve.

B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing No. 6 sieve and a maximum of 10 percent passing No. 40 sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.

E. Sand: Clean, washed, natural or manufactured, free of toxic materials.

2.6 PLANTING ACCESSORIES

A. Non-Selective Herbicide: Roundup-Pro, Finale or equivalent.

B. Selective Post Emergent Herbicide: EPA registered and approved, of type recommended by manufacturer for application.

C. Selective Pre-Emergent Herbicide: EPA registered and approved, of type recommended by manufacturer for application.

2.7 PLANTING SOIL MIX

A. Planting medium containing 75 percent specified topsoil mixed with 15 percent organic soil amendments and 10 percent sharp washed sand.

2.8 FERTILIZER

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.
   1. Composition: Nitrogen, phosphorous, and potassium in amount required to remedy deficiencies identified in the results of the existing topsoil and in-place topsoil test performed by the geotechnical engineering company and the CTL.

B. Slow-Release Fertilizer: Use one of the following:
   1. Osmocote Standard Granular fertilizer by Scotts Company composed of 13 percent nitrogen, 13 percent phosphorous, and 13 percent potassium, by weight.
   2. Multi-Cote All Purpose by Schultz composed of 17 percent nitrogen, 17 percent phosphorous, and 17 percent potassium, by weight.

C. Deliver fertilizer, mixed as specified, in original unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear manufacturer's guaranteed statement of analysis, or manufacturer's certificate of compliance covering analysis shall be furnished to Owner. Store fertilizer in such manner that it shall be kept dry.

2.9 MULCH

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Shredded Hardwood Mulch: Obtain shredded hardwood mulch consisting of long fibrous interlocking strands from a local source harvested in a sustainable manner. Pine Bark mulch is not acceptable.

2.10 WATER

A. Potable water, hose, and other watering equipment.

2.11 EROSION CONTROL BLANKET

A. Erosion control blankets shall be the type and material composition as applicable in accordance with ECTC Standard Specification for Rolled Erosion Control Products.

3.EXECUTION

3.1 PREPARATION

A. If project completion date prohibits in-season planting, prepare for out-of-season seeding or sodding so that lawns shall be completed and ready for acceptance at time of project completion.

B. Unsuitable Subsoils: Locations containing unsuitable subsoil shall be treated by one or more of the following:
   1. Where unsuitability is deemed by Owner to be due to excessive compaction caused by heavy equipment and where natural subsoil is other than AASHTO classification of A6 or A7, loosen such areas with spikes, discing, or other means to loosen soil to condition acceptable to Owner. Loosen soil to minimum depth of 12 inches with additional loosening as required to obtain adequate drainage. Contractor may introduce peat moss, sand, or organic matter into the subsoil to obtain adequate drainage. Such remedial measures shall be considered as incidental, without additional cost to Owner.

2. Where unsuitability is deemed by Owner to be due to presence of boards, mortar, concrete, or other construction materials in sub-grade and where natural subsoil is other than AASHTO classification of A6 or A7, remove debris and objectionable material. Such remedial measures shall be considered as incidental, without additional cost to Owner.
3. Where unsuitability is deemed by Owner to be because natural subsoil falls into AASHTO classification of A6 or A7 and contains moisture in excess of 30 percent, then installation of sub-drainage system or other means described elsewhere in Specifications shall be used. Where such conditions have not been known or revealed prior to planting time and they have not been recognized in preparation of The Drawings and Specifications, then Owner shall issue pricing order to install proper remedial measures.

C. Perform planting operations at steady rate of work unless weather conditions make it impossible to work. No plant material shall be planted in frozen ground.

D. Tree and Shrub Preparation
1. Dig bare-rooted shrubs with adequate fibrous roots. Cover roots with uniformly thick coating of mud by being puddled immediately after they are dug or packed in moist straw or moss.
2. Dig ball and burlap plants with firm natural balls of earth of diameter and depth to include fibrous roots.
3. Protect roots or balls of plants at all times from sun and drying winds.
4. Ball and burlap plants which cannot be planted immediately upon delivery shall be set on ground and protected with soil, wet moss, or other acceptable material. Heel-in bare rooted plants that cannot be planted immediately upon delivery. All shall be kept moist.
5. Open and separate bundles of plants before roots are covered. Prevent air pockets among roots. During planting operations, cover bare roots with canvas, hay, or other suitable material. Plants shall not be bound with wire or rope which will result in damage to bark or branches.

E. Sod and Seed Bed Preparation
1. Newly Graded Subgrades:
   a. Do not place topsoil until subgrade has been approved in accordance with the plans and details.
   b. Before placing topsoil, rake subsoil surface clear of stones, debris, and roots. Disk, drag, harrow, or hand rake subgrade to depth of 4 inches and remove stones larger than 1-1/2 inches to provide bond for topsoil.
   c. Spread topsoil to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Adjust depth of topsoil in areas adjacent to paved surfaces or curbs to allow for the placement of sod or seed.
2. Unchanged Subgrades: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface as follows:

a. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
b. Disk, drag, or harrow surface soil to a depth of at least 6 inches.
c. Remove stones larger that 1-1/2 inch in any dimension and sticks, roots, trash, and other extraneous matter.
d. Legally dispose of waste material, including grass, vegetation, and turf.
e. Adjust depth of topsoil in areas adjacent to paved surfaces or curbs to allow for the placement of sod or seed.

3. Incorporate soil amendments and commercial fertilizer into the top 4 inches of topsoil to achieve the specified topsoil requirements. Till soil to a homogenous mixture of fine texture.
4. Grade areas to finish grades, filling as needed or removing surplus topsoil. Float areas to smooth, uniform grade as indicated on the Drawings. Lawn areas shall slope to drain.
5. Where no grades are shown, areas shall have a smooth and continual grade between existing or fixed controls, such as walks, curbs, catch basin, steps, or buildings. Roll, scarify, rake, and level as necessary to obtain true, even lawn surfaces. Finish grades shall meet approval of Owner before grass seed is sown or sod is placed.
6. Sod and seed beds shall be permitted to settle or shall be firmed by rolling before seeding begins.

3.2 PROTECTION

A. Topsoil, which must be transported across finished sidewalks, shall be delivered in such manner that no damage will be done to sidewalks.

B. Before commencing work, trees and shrubs that are to be saved shall be protected from damage by placement of fencing flagged for visibility or some other suitable protective procedure approved by Owner.

C. Trucks or other equipment shall not be driven or parked within drip line of any tree unless tree overspreads paved area.

D. Use precautionary measures when performing work around trees, sidewalks, pavements, utilities, and other features either existing or previously installed.

E. Adjust depth of earthwork and topsoil when working immediately adjacent to aforementioned features in order to prevent disturbing tree roots, undermining sidewalks and pavements, and damage in general to other features either existing or previously installed.

F. Cover plants transported to project in open vehicles with tarpaulins or other suitable covers securely fastened to body of vehicle to prevent injury to plants. Closed vehicles shall be adequately ventilated to prevent overheating of plants. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage shall be cause for rejection. Plants shall be kept moist, fresh, and protected.

Such protection shall encompass entire period during which plants are in transit, being handled, or are in temporary storage.

G. Plants shall not be delivered to the site more than seven days prior to planting. Plants not planted within 48 hours of delivery, shall be healed in (covered with sawdust, soil or mulch), and the containers or balls protected from wind and temperature and kept moist until planting.

3.3 PLANTING BED ESTABLISHMENT

A. Prior to preparing planting beds, the area shall conform to the lines and grades shown on the plans and the condition of the subsoil shall be approved by the Owner.

B. Contractor shall verify the location of any underground utilities on site.

C. Planting beds where existing subsoil is determined by Owner to be unsuitable for plant growth in accordance paragraph Unsuitable Subsoil herein shall be excavated to a depth of 24 inches or as needed to provide adequate drainage. Replace excavated soil with planting soil mix.

D. Planting beds where existing subsoil is acceptable by Owner shall be prepared as follows:
   1. Seven days prior to commencing establishment of the planting areas, apply nonselective herbicide. Remove dead vegetation.
   2. Loosen subsoil to a depth of 12 inches. Remove stones larger than 1 inch in any dimension, sticks, roots, rubbish, and other extraneous matter and legally dispose of them off site.
   3. Spread 3 inches of soil conditioner over the surface of the planting area and incorporate into the top 12 inches of the soil. Prior to spreading soil conditioner, add or remove topsoil as needed to accommodate addition of soil conditioner and to achieve finish grade.
   4. Till planting soil mix to a homogenous mixture of fine texture.
   5. Float areas to smooth, uniform grade providing positive drainage out of planting beds and away from structures or as indicated on the Drawings.

E. Apply slow-release fertilizer at a rate of 1-1/2 pounds per 100 square feet for beds areas or as recommended by manufacturer and incorporate into the top 8 inches.

3.4 TREE AND SHRUB PLANTING

A. Plants too large for 2 persons to lift in and out of holes shall be placed with sling. Do not rock trees in holes to raise.

B. If rock or other underground obstruction is encountered, Owner may require plant pits to be relocated, pits enlarged, or plants deleted from project.

C. Make adjustments in locations as directed. In event that pits or areas for planting are prepared and backfilled with planting soil mix or topsoil to grade prior to commencement of lawn operations, they shall be so marked that when planting proceeds, they can be readily located. In case underground obstructions such as ledges or utilities are encountered, change location under direction of Owner without charge.

D. Holes for trees shall be at least 2 feet greater in diameter than spread of root system and at least 6 inches deeper than root ball or as shown on the Drawings. Holes for shrubs shall be at least 2 feet greater in diameter than the spread of root system and at least 2 feet deep or as shown on the Drawings. Holes for vines shall be at least 12 inches greater in diameter than the spread of root ball at least 12 inches deep.

E. Backfill tree holes and shrub beds with planting soil mix. Apply slow-release fertilizer at a rate of 1/4 pounds per caliper inch for trees. Incorporate fertilizer into the planting soil mix.

F. Plants shall be planted at same depth as they had previously grown or as shown on the drawings. Backfill planting soil mix in layers of not more than 8 inches and each layer watered sufficiently to settle before next layer is placed. Tamp planting soil mix under edges of balled plants. Use enough planting soil mix to bring surfaces to finish grade when settled.
   1. Provide saucer around each plant as shown on The Drawings.
   2. Soak plants with water twice within first 24 hours after time of planting. Apply water with low pressure so as to soak in thoroughly without dislodging topsoil.

3.5 MISCELLANEOUS INSTALLATIONS

A. Mulch: Use shredded hardwood mulch as a top dressing in planting beds. Mulch single trees or shrubs to outside edge of saucer.
   1. Place weed mat under planting areas that will not be seeded and in any other locations as shown on the Drawings. Cover weed mat with 4 inches of shredded hardwood mulch and secure in place with soil staples.

B. Areas to be covered with erosion control blankets shall be properly prepared, fertilized, and seeded before blanket is applied. When blanket is unrolled, netting shall be on top and fibers in contact with soil. In ditches, apply blanket in direction of flow of water. On slopes, apply blankets vertically on slope. Overlap ends and sides 6 inches and staple to manufacturer's recommendations.

3.6 AREAS TO BE TURFED

A. Unless otherwise shown on the plans, disturbed areas shall be permanently seeded.

B. Continually seed remaining disturbed areas until fully turfed with no bare spots.

3.7 SEEDING

A. Do not perform seeding in windy conditions.

B. Seeding shall be dispersed in 2 directions at right angles to each other.

C. Seed lawn areas by sowing evenly with approved mechanical seeder at rate of minimum of 3 pounds per 1,000 square feet. Culti-packer or approved similar equipment may be used to cover seed and to form seedbed in 1 operation. In areas inaccessible to culti-packer, lightly rake seeded ground with flexible rakes and roll with water ballast roller. After rolling, seeded areas shall be lightly mulched with straw mulch.

D. Surface layer of soil for seeded areas shall be kept moist during germination period. Water seeded areas twice first week to minimum depth of 6 inches with fine spray and once per week thereafter as necessary to supplement natural rain to equivalent of 6 inches depth.

3.8 MAINTENANCE DURING CONSTRUCTION

A. Begin maintenance operations immediately after each plant is planted and continue as required until acceptance. Water, mulch, weed, prune, spray, fertilize, cultivate, and otherwise maintain and protect plants. Reset settled plants to proper grade and position, restore planting saucers, and remove dead, diseased, or unhealthy plant material. Tighten and repair stakes and wires. Correct defective work as soon as possible after it becomes apparent and weather and season permit.

B. Upon completion of the planting operations, clean up landscaped areas to be free of stones, containers, trash, and other waste and debris to leave area in a neat and well-groomed appearance.

C. Supplement rainfall as required to provide an equivalent of 1 inch of water per week until the plants have rooted and are established.

D. Maintain all plant material in a healthy, vigorous growing condition.

E. Make weekly inspections to determine moisture content of soil and adjust watering schedule established by irrigation system installer to fit conditions.

F. After grass growth has started, reseed or sod areas that fail to show uniform stand of grass in accordance with The Drawings and as specified herein. Continue Reseeding and sodding such areas repeatedly until areas are covered with satisfactory growth of grass. Perform removal and replacement or topsoil conditioning if required to facilitate establishment of grass.

G. Water in such manner and as frequently as is deemed necessary by Owner to assure continued growth of healthy grass. Water areas of site in such a manner as to prevent

erosion due to excessive quantities applied over small areas and to avoid damage to finished surface due to watering equipment.

H. Provide water for execution and maintenance at no expense to Owner. Furnish portable tanks, pumps, hose, pipe, connections, nozzles, and any other equipment required to transport water from available outlets and apply it to seeded areas in approved manner.

I. Mowing:
   1. Initiate mowing of turf grass areas when grass has attained height of 3 inches and roots are firmly established. Maintain turf grass height at 2 1/2 to 3 inches at subsequent cuttings depending on time of year. Remove no more than 1/3 of grass leaf at any cutting and cutting shall not occur more than 10 days apart.
   2. Mow native grass areas no more than 3 times per year to a height of no less than 4 inches.

J. Remove heavy cuttings to prevent destruction of underlying turf. If weeds or other undesirable vegetation threaten to smother planted species, such vegetation shall be mowed or, in case of rank growths, shall be uprooted, raked, and removed from area by methods approved by Owner.

K. Remove weeds and other undesirable vegetation by applying herbicides as recommended by the manufacturer or by uprooting. Rake and remove uprooted vegetation from area by methods approved by Owner.

L. Protect seeded area from pedestrian or vehicular trespassing while grass is germinating. Provide fences, signs, barriers, or other necessary temporary protective devices. Repair damage resulting from trespass, erosion, washout, settlement, or other causes.

M. Remove fences, signs, barriers, or other temporary protective devices after final acceptance.

N. Remove and replace diseased, distressed, dead, or rejected plants prior to Substantial Completion Date.

O. Replacements shall be plants of same variety and size specified on The Drawings. Furnish and plant as specified herein. Replacements resulting from removal, loss, or damage due to occupancy of project in any part, vandalism, physical damage by animals, vehicles, etc., and losses due to curtailment of water by local authorities will be approved and paid for by Owner.

P. Grassed areas damaged during process of work shall be restored or repaired to condition satisfactory to the Owner. Fill, grade, re-fertilize, replant, or mulch as required to restore to contract requirements.

3.9 QUALITY CONTROL

A. Contractor Quality Control: Retain an independent soil testing laboratory to sample and test imported topsoil.
   1. Topsoil Analysis: Collect 5 random samples from the topsoil borrow area. Combine samples and test as a composite for percentages of organic matter; presence of herbicides; percentage of sand, silt, and clay content; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
   2. Submit test reports in accordance with Part I herein.

3.10 WARRANTY CHART

A. Commence Warranty period immediately after Substantial Completion Date and continue as indicated on the following chart:

B.

WARRANTY CHART		
Substantial Completion Date	Extended Maintenance / Warranty Expiration	Duration
December	July	19 months
January	July	18 months
February	July	17 months
March	July	16 months
April	July	15 months
May	July	14 months
June	July	13 months
July	July	12 months
August	August	12 months
September	September	12 months
October	October	12 months
November	November	12 months

END OF SECTION 029000

STANDARD SPECIFICATIONS
SECTION 029200
LAWNS AND GRASSES

PART I GENERAL

1.1 DESCRIPTION

A. Section includes requirements for preparation of seed and sod bed, seeding, sodding, fertilizing, liming, and mulching to limits shown, and as required for restoration and restabilization of disturbed areas, at Engineer's direction.

1.2 RESTORATION

A. As defined below, and when noted in Restoration Schedule on Drawings.
   1. Type A: Sod for established lawns, athletic fields, park lawns, and frequently mowed public spaces.
   2. Type B: Sod for sodded swales.
   3. Type C: Surge stone for seeded and stone lined swales.
   4. Type D: Seed for improved areas.
   5. Type E: Seed for unimproved and outfall areas.
   6. Type F: Development sites with existing stabilization of temporary mulch or planted seed.
      a. Restore in kind and maintain.

B. Service Connection Contracts (SC, LC, AC) and Sewer Rehabilitation Contracts as specified herein.
   1. Type A.
   2. Type D.

I.3 SUBMITTALS

A. Submit following Section 01450.
   1. Certificates of Compliance Before Delivery of Materials:
      a. Topsoil.
      b. Seed.
      c. Sod.
      d. Fertilizer.
      e. Lime.

PART 2 PRODUCTS

2.1 TOPSOIL

A. Properties
1. Fertile natural surface agricultural soil capable of sustaining vigorous plant growth.
2. Containing not less than 1-1/2 percent organic matter as determined by MSHA Standard Method of Test.
3. pH value of not less than 6.5.
4. Free of stones, roots, rubbish, and other objectionable materials such as Bermuda grass, poison ivy, and kindred roots, and material harmful to plant growth.
5. Sufficient pore space to permit adequate root penetration.
6. Meet analysis of sand, silt, and clay when determined following AASHTO M146 with these exceptions:

	Percent Passing by Weight	
	Minimum	Maximum
Sand	20	75
Silt	10	60
Clay	5	30

B. Topsoil available on site that meets above specified requirements may be utilized with Engineer's approval.

2.2 SPECIAL PURPOSE TOPSOIL

A. Hand spreadable and meeting requirements listed above for topsoil and following gradation:

Sieve	Minimum Percent Passing by Weight
2-inch	100
No. 4	90
No. 10	80

B. Topsoil available on site that meets above specified requirements for special purpose topsoil may be utilized with Engineer's approval.

2.3 SEED

A. For dry and semi-shady improved areas mowed regularly: Sow following mixtures at 195 pounds per acre or 4 5 pounds per 1,000 square feet between March 1 and May 31 and between August 15 and October 31.

TYPE OF GRASS	PERCENT	CERTIFIED SPECIES
Tall Fescue	90-100	Adventure, Apache, Arid, Falcon, Finelawn I, or Rebel II.
Kentucky Bluegrass	0-10	Common, Kenblue, Vica, Ram 1, or Monopoly.

B. For dry, heavily shaded improved areas mowed regularly: Sow mixture at 175 pounds per acre or 4 pounds per 1,000 square feet between March 1 and May 31 and between August 15 and October 31.

TYPE OF GRASS	PERCENT	CERTIFIED SPECIES
Tall Fescue	65	Adventure, Apache, Arid, Falcon, Finelawn I, or Rebel II.
Perennial Ryegrass	10	All-Star, Blazer, Manhattan, Palmer, Pennant, Pennfine, Premier, Prelude, Regal, or Repell.
Creeping Red Fescue and/or Chewings Fescue	25	Penlawn, Flyer, Longfellow, Victory, or Jamestown

C. For unimproved drought-prone areas not to be mowed or mowed infrequently: Sow mixture at 175 pounds per acre or 4 pounds per 1,000 square feet between March 1 and May 31 and between August 15 and October 31.

TYPE OF GRASS	PERCENT	CERTIFIED SPECIES
Tall Fescue	80	Kentucky 31
Perennial Ryegrass	20	Common

D. For unimproved areas that are poorly drained and subject to frequent flooding: Sow mixture at 130 pounds per acre or 3 pounds for I,000 square feet between March l and May 31 and between August 15 and October 31.

TYPE OF GRASS	PERCENT	CERTIFIED SPECIES
Tall Fescue	75	Kentucky 31
Reed Canarygrass	25	Common

E. Temporary grass stabilization: Use 1 of following, but not in maintained turf areas.

TYPE OF GRASS	SOWING INSTRUCTIONS
Barley or Annual Ryegrass	Sow mixture at 50 pounds per acre or I pound per 1,000 square feet between March 1 and May 31 and between August 15 and October 15.
Foxtail Millet	Sow mixture at 50 pounds per acre or 1 pound per 1,000 square feet between May 31 and August 15.

2.4 SOD

A. Grade: Certified or Approved as designated by Illinois Department of Agriculture.
   1. Machine cut sod at uniform thickness of 5/8 inch ± 1/4-inch, excluding top growth and thatch.
   2. Use individual sod pieces strong enough to support their own weight when lifted by ends.
   3. Broken pads, irregularly shaped pieces, and tom or uneven ends will not be acceptable.
   4. Lay sod between September 15 and May 15. Do not lay on frozen ground.

B. Replacement:
   1. For replacing previously established turf, use sod similar to what existed before construction.

2.5 FERTILIZER

A. Uniform composition, free flowing and delivered to site fully labeled according to applicable state fertilizer laws and bearing name, trade name, or trademark and warranty of producer.

B. Submit soil samples to approved soils testing laboratory for fertilizer recommendations.
   1. Submit recommendations and receive Engineer's approval before implementation.

C. Unless otherwise directed, fertilize at following rates:
   1. Temporary Seeding: 10-10-10 or equivalent at rate of 600 pounds per acre or 15 pounds per 1,000 square feet.
   2. Permanent Seeding: 1000 pounds per acre of 10-20-20 or equal.
   3. Sodding:
      a. Immediately before sod placement, apply 3.5 pounds of slow-release nitrogen per 1,000 square feet.
      b. Slow-release nitrogen: Approximately 1/3 immediately available and 2/3 water insoluble, such as Urea formaldehyde or isobutyledene urea.
      c. Rate: 15 pounds of 10-20-10 per 1,000 square feet after sodding.

2.6 LIME

A. Contents: Ground limestone containing at least 50 percent total oxides (calcium oxide plus magnesium oxide).
   1. Limestone: Ground to Oneness so that at least 50 percent will pass through 100 mesh sieve and 98 percent will pass through 20 mesh sieve.

B. Rate: 2 tons per acre, 100 pounds per 1000 square feet.

2.5 MULCH

A. For Protection of Permanent Seeding:
   1. Straw: Clean, weed free, unrotted, applied at rate of not less than 100 pounds per 1,000 square feet, 2 tons per acre, and anchored with 1 of following methods.
      a. Mulch anchoring tool for flat slopes, mulch nettings, and cut back or liquid binders listed following manufacturer's recommendation.
      b. Acrylic DLR (Agro-Tack).
      c. DCA-70.
      d. Petroset.
      e. Terra Tax II.
      f. Terra Tack AR.
      g. Or equal.
   2. Mulch: Jute or excelsior blanket.
   3. Wood Chips: Coverage 1-1/2 inches deep.

B. Mulch Utilized as Temporary Protection and Stabilization: Follow above materials requirements, except Engineer will set rate of application.

PART 3 EXECUTION

3.1 PERMANENT SEEDING

A. Preparation:
   1. Harrow, disc, or otherwise loosen subsoil to depth of 4 inches.
   2. Spread topsoil evenly over prepared subsoil to following depths:
      a. Topsoil:
         1) Slopes 3:1 or steeper: 2 inches after compaction.
         2) Slopes flatter than 3:1: 4 inches after compaction.
      b. Composted Sludge:
         1) All areas: 2 inches after compaction.
   3. Where existing topsoil does not meet these requirements, provide required topsoil to meet above minimum thicknesses.
   4. Remove objectionable material such as stones 2 inches or larger, clods, brush, roots, and trash from top 4 inches of soil.
   5. Perform harrowing, discing, scarifying, and raking on contour of slopes steeper than 3:1.

B. Amendments:
   1. Apply lime and fertilizer at rates specified in PART 2, PRODUCTS, and thoroughly mix into top 6 inches.
      a. When composted sludge is used instead of topsoil, lime and fertilizer may be eliminated.
      b. Scarify area and rake until surface is leveled to give a maximum of 2 inches in variation, and soil is easily crumbled and uniform fine texture.

C. Seed Application:
   1. Apply mixture uniformly with mechanical power-driven seeders, mechanical cyclone hand seeders or hydroseeding equipment.
   2. Slurry for hydroseeder may contain seed and fertilizer only. Disc seed 1 inch into soil in floodplain areas.
   3. Rake, roll, or drag seedbed in all other areas, if hydroseeder or cyclone seeder is used.
   4. Moisten seedbed during periods of drought and/or high temperatures.

D. Mulch Application:
   1. Apply at rates specified in PART 2 PRODUCTS herein.
   2. Anchor as specified in PART 2 PRODUCTS herein.

3.2 TEMPORARY SEEDING

A. Preparation:
   1. Loosen top 2 inches of seedbed.
   2. Apply lime and fertilizer at rates specified in PART 2 PRODUCTS.

B. Seed Application: Follow application for permanent seeding.

C. Mulch Application: Follow application for permanent mulching.

3.3 SODDING

A. Preparation:
   1. After removing existing grass surface, grade baseball and softball fields as shown on the Construction Drawings.
   2. Remove objectionable material such as stones, clods, and trash from top 4 inches of soil.

B. Amendments:
   1. Apply lime and fertilizer at rates specified in PART 2, PRODUCTS, and thoroughly mix into loosened subsoil.
   2. Scarify area and rake until surface is leveled to a maximum of 2 inches in variation, and soil is easily crumbled and uniform fine texture.

C. Sodding:
   1. Lay between September 15 and May 15.
   2. Deliver to site within 24 hours, and install within 36 hours, after cutting.
   3. During wet weather, dry sod sufficiently to prevent tearing during handling and placing.
      a. During dry weather, water sod sufficiently before lifting to ensure its vitality and to prevent dropping off of soil during handling.
   4. Desiccated sod will be rejected; replace at no cost to Rock Valley College.
   5. Place sod in straight lines parallel to one another.
      a. Stagger lateral joints and butt tight.
      b. On slopes 5:1 and steeper place sod with long edges parallel to contour starting at top of slope.
   6. On slopes 2:1 and steeper and in surface drainage V-shaped or flat-bottomed ditches, stake each strip of sod with at least 2 stakes, spaced not more than 2 feet apart, or wire staples.
   7. Immediately after completing section of sodding, roll, tamp, and water until underside of sod pad and soil surface beneath it are thoroughly wet and in contact with each other to eliminate air pockets.
   8. Completion of placing, rolling, tamping, and watering: Within 8-hour period.
   9. Moisten dry sod bed during periods of drought or high temperatures.

3.4 MULCH ONLY

A. Grade as required.

B. Place and anchor mulch only at rates specified in PART 2, PRODUCTS, where indicated and directed by Engineer.

3.5 TIME RESTRICTIONS

A. When permanent seeding or sodding is specified or directed, and is not allowed because of time restrictions specified above, utilize 1 or more of following methods to prevent erosion and sedimentation until permanent seeding or sodding is allowed.
   1. Place and anchor straw mulch or wood chips.
   2. Apply temporary seeding and mulch.
   3. Prepare soil as for permanent seeding and then mulch as specified herein; overseed during next seasonal seeding period.
   4. Provide other erosion control measures acceptable to Engineer.
   5. Remove straw or wood chips used as temporary mulch or work into subsoil minimum depth of 6 inches before initiation of permanent seeding or sodding application.

3.6 MAINTENANCE OF SEEDED AND SODDED AREAS

A. Maintain seeded and sodded areas until accepted in writing by Engineer.
   1. Water seeded and sodded areas as necessary to establish growth.

B. Inspect seeded and sodded areas for failures and necessary repairs.

C. Provide replacements during specified planting seasons.

D. When Engineer determines stand of turf is inadequate:
   1. Overseed and fertilize using 1/2 of rates originally applied.
   2. Resod.

E. When Engineer determines stand is over 60 percent damaged:
   1. Reestablish following original lime, fertilizer, and seed.
   2. Prepare sod bed following seeding or sodding recommendations.

PART 4 MEASUREMENT AND PAYMENT

4.1 SEEDING AND SODDING

A. Seeding, sodding, mulch, fertilizer, lime, topsoil, and preparation of need and sod bed to limits indicated, as directed by Engineer, and to repair damage caused by Contractor's operations, will not be measured for payment, but will be considered incidental to Contract.

END OF SECTION 029200

SECTION 260500 – BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Basic Electrical Requirements are specifically applicable to Division 26 Sections, in addition to Division 1 - General Requirements.

B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 DESCRIPTION

A. Apparatus, appliance, material or work not shown on drawings, but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete and ready for operation, even though not specified or shown on the drawings, shall be furnished and installed without additional expense to the Owner.

B. Should there be any discrepancies or a question of intent, refer the matter to the Owner for a decision before ordering any equipment, materials or before starting any related work.

C. Furnish, erect, install, connect, clean, adjust, test and condition all manufactured articles, materials and equipment, and place in service in accordance with the manufacturer’s directions and recommendations except as otherwise noted.

D. Provide all motor starters and disconnects not identified elsewhere in these documents and provide power wiring to all equipment.

E. Control wiring of all instrumentation, probes, meters, pressure switches etc, excluding control panels and termination of instrumentation therein shall be provided under this contract.

1.3 QUALITY ASSURANCE

A. Carefully examine the contract documents, visit the site, and thoroughly become familiar with the local conditions relating to the work. Failure to do so will not relieve the contractor of the obligations of the contract.

B. Materials and installation shall conform to the applicable Codes and Standards.

C. After all equipment, devices and raceways are installed and wires and cables are in place and connected to devices and equipment, test the system for continuity, proper phase rotation, short circuit, improper grounds, and other defects. If defective condition is present, make all necessary corrections and retest for compliance. Test systems for proper operation and demonstrate to the Owner.

D. Codes and Standards:

1. Materials and installation shall comply with codes, laws and ordinances of Federal, State, and local governing bodies having jurisdiction.
2. In every installation where regulations of electric utility and telephone companies apply, conformance with their regulations is mandatory and any costs involved shall be included in the Contract, with the exception of extra facility and other charges which are directly paid by the Owner.
3. In case of differences between building codes, State and Federal laws, local ordinances and utility company regulations and the Contract Documents, the most stringent shall govern.
4. Should work be performed which does not comply with the requirements of the applicable building codes, State and Federal laws, local ordinances, industry standards and utility company regulations, changes for compliance shall be done at no addition cost to the Owner.
5. Secure and pay for all permits, governmental fees, taxes and licenses necessary for the proper execution and completion of Division 26 work.
6. Prepare shop drawings required and submit copies of shop drawings to governmental agencies and utility companies for their required approval.
7. Notify the Owner of any materials or apparatus believed to be inadequate, unsuitable, in violation of laws, ordinances, rules or regulations of authorities having jurisdiction.

1.4 SUBMITTALS

A. Progress Schedule: Submit schedules in accordance with the General Conditions and Division I.

B. Shop Drawings: Submit in accordance with the General Conditions and Division I. Refer to individual Sections of Division 26 for supplementary requirements.

C. Substitutions: Refer to the General Conditions and Division 1.

1. Submit design data such as, but not limited to, photometric lighting calculations, short circuit calculations, etc. for any substituted materials.

D. Maintenance Manuals: Submit copies of maintenance manuals in hard bound covers containing approved shop drawings, manufacturers' repair manuals, guarantees, operating instructions, wiring diagrams and parts lists.

E. As soon as practical after award of contract and before any material for equipment is purchased, the Contractor shall submit for review, as required under General Conditions, the number of copies of all shop drawings. The list of required shop drawings and catalog cuts, etc., will be included at the end of this section of the specification. Shop drawings shall include manufacturer names, catalog numbers, cuts, diagrams and other such descriptive data as may be required to identify and approve the equipment. A complete list in one category of all shop drawings, catalog cuts, material lists, etc., shall be submitted by this Contractor at one time.

F. Any listed materials, fixtures, apparatus, or equipment that is not in accordance with specification requirements can and will be rejected for use in this installation and construction.

G. Any materials, fixtures, apparatus or equipment not in accordance with Contract Documents shall be removed by the Contractor and replaced with specified equipment at the direction of the Owner and without recourse for additional compensation.

H. The following is a list of items requiring submittal:

Item
Variable Frequency Motor Controllers
Irrigation System Panel and Remote Controllers
Circuit Breakers
Conduit and Fittings
Boxes and Handholes
Wire and Cable
Wiring Devices

I. Instruction Manuals: Submit a minimum of two (2) complete bound sets of instruction manuals.

J. Field Record Drawings: Submit field record drawings for the work completed.

1.5 GUARANTEE

A. Electrical work shall be guaranteed for materials and labor for a period of one (1) year in accordance with the General Conditions and Division 1.

B. Manufacturers' equipment guarantees or warranties for periods of more than one year shall be included in the Maintenance Manuals.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable local codes and standards.

B. Electrical: Conform to NFPA 70 - 2020.

C. Obtain permits and request inspections from authority having jurisdiction.

1.7 DEFINITIONS

A. Factory-Wired Panel Means: Provided as part of equipment package; including starters, disconnects (except for disconnects indicated on Electrical Drawings on line side of FWP), control transformers, integral control devices and pre-wired controls; ready for final control and power connections.

B. Provide Means: Furnish and install.

C. Basic Electrical Requirements Means: Applies to all Sections of Division 26.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment shall be new, UL or CSA labeled and shall bear the manufacturer's name, model number and other identification markings.

B. Materials and equipment shall be the standard product of a manufacturer regularly engaged in the production of the required type of material or equipment for at least five years and shall be the manufacturer's latest design with published properties.

C. Equipment and materials of the same general type shall be of the same manufacturer throughout the project to provide uniform appearance, operation and maintenance.

D. Equipment and materials shall be without blemish or defect and shall not be used for temporary light or power purposes, including lamps, without the Owner's written authorization.

E. Where two or more makes or kinds of material or equipment are specified, indicate which choice will be used. This information shall be included with the list of manufacturers for equipment and materials submitted to the Owner as specified under "Submittals'[1].

F. Provide all starters, except where included as part of packaged equipment. Verify motor sizes for starters including verification of specified number of auxiliary contacts.

2.2 MANUFACTURER'S NAMEPLATES

A. Each major electrical component such as switchgear, switchboards, transformers, motor control centers, panelboards, circuit breakers, disconnect switches, etc. shall have the manufacturer's name and address, catalog number, and rating on a plate or label located inside the cover or in any other inconspicuous but readily accessible location.

PART 3 - EXECUTION

3.1 DELIVERY AND STORAGE

A. Receive, handle, and store electrical items and materials at the project site. Materials and electrical items shall be so placed that they are protected from theft, damage and deterioration.

3.2 INSTALLATION

A. The drawings for work under Division 26 are diagrammatic and are intended to convey the scope of work and indicate the general arrangement of conduit, boxes, equipment, fixtures and other work included in the contract

B. Location of items required by the drawings or specifications not definitely fixed by dimensions are approximate only and exact locations necessary to secure the best conditions and results shall be determined at the site and shall be subject to approval.

C. Follow drawings in laying out work**,** check drawings of other trades to verify spaces in which work will be installed and maintain maximum headroom and space conditions at all points.

1. Where headroom or space conditions appear inadequate, the Owner shall be notified before proceeding with installation.
2. Minor conduit rerouting and changes shall be made at no additional cost to the Owner.

D. Perform all work with skilled mechanics of the particular trade involved in a neat and workmanlike manner.

E. Perform all work in cooperation with other trades and schedules.

F. Furnish other trades advance information on locations and sizes of frames, boxes, sleeves and openings needed for the work, and also furnish information and shop drawings necessary to permit trades affected to install their work properly and without delay.

G. Where there is evidence that work of one trade will interfere with the work of other trades, all trades shall assist in working out space allocations to make satisfactory adjustments and shall be prepared to submit and revise coordinated shop drawings.

H. Without additional cost to the Owner, make minor modifications in the work as required by structural interferences, by interferences with work of other trades or for proper execution of the work.

I. Work installed before coordinating with other trades so as to cause interference with the work of such other trades shall be changed to correct such condition without additional cost to the Owner and as directed by the Architect/Engineer.

J. Minor changes in the locations of outlets, fixtures and equipment shall be made prior to rough-in at the direction of the Owner and at no additional cost to the Owner.

K. Electrical Contractor shall cooperate with other trades and coordinate work so that conflicts with other work are eliminated.

L. Equipment shall be installed with adequate space allowed for removal, repair or changes to equipment Ready accessibility to removable parts of equipment and to wiring shall be provided without moving other equipment which is to be installed or which is in place. Electrical Contractor shall verify measurements. Discrepancies shall be brought to the Architect/Engineers attention for interpretation.

M. Determine temporary openings in buildings that will be required for the admission of apparatus furnished under this Division and notify the Owner accordingly. In the event of failure to give sufficient notice in time to arrange for these openings during construction, assume all costs of providing such openings thereafter.

N. Location of electrical outlets, panelboards, cabinets, equipment, etc. is approximate and exact locations shall be determined at the project.

O. Electrical Contractor shall refer to Contract Documents for details, reflected ceiling plans, and large scale drawings.

3.3 COOPERATION

A. Where jurisdictional rules require the assistance of electrical mechanics in the moving and setting of electrically powered equipment, provide such assistance.

B. Where work covered by this Section connects to equipment furnished under other Sections, verify electrical work involved in the field and make proper connection to such equipment.

3.4 IDENTIFICATION OF ELECTRICAL ITEMS

A. Provide permanent identification markings and nameplates for wiring and each item of electrical apparatus and associated controlled equipment, with the same inscriptions as shown on the Drawings, or as directed, clearly and neatly applied.

B. Provide the following identification markings on each circuit breaker, disconnect switch, contactor, motor starter, etc.

1. Feeder name, number, voltage.
2. Items of equipment controlled.

C. Provide feeder name, number, and voltage identification markings on each motor and other utilization equipment, except lighting fixtures.

D. Provide the following identification markings on each transformer:

1. Feeder name, number, voltage.
2. Names of lighting and/or power panels supplied by the secondary of the transformer.
3. Transformer identification shown on the Drawings.

E. Provide the following alkyd paint stenciled inscription markings on the outside face and on the inside face of each feeder splice box, feeder junction box**,** and feeder pull box cover plate:

1. Designation shown on the drawings.
2. Feeder name, number, voltage.

F. Apply engraved plastic laminate nameplates with non-corroding type screw fasteners or rivets to all motor starters, disconnect switches, relays, remote control panels, push button stations, panelboards, switchgears, transformers, and other electrical apparatus. Nameplates shall be white with black core, 1-1/4" x 3" minimum, 3/16" high lettering.

G. Provide a typewritten directory of circuits in panelboards and provide panel identification in black alkyd paint stenciled inscriptions on the inside of the door, directly above the center line of directory frame, or on vertical and horizontal center line of doors without directory frames.

H. Provide on device plates for local toggle switches, toggle switch type manual starters, pilot lights, and other electrical items, whose function is not readily apparent, engraved suitable inscriptions or plastic laminate nameplates describing the equipment controlled or indicated.

I. Embossed self-adhering plastic tape labels will not be accepted.

J. Each wire and each cable shall be labeled at terminals and at all accessible points in equipment, panelboards, manholes, handholes, and pull boxes. Labels shall be self-sticking wire markers.

K. Identify underground systems using underground warning tape. Install one tape per trench at 3" below finished grade.

L. For exterior installations, conduits, except branch lighting circuit conduits, shall be tagged at the ends and in intermediate boxes, chambers, manholes, handholes, and other enclosures in accordance with the same inscriptions as shown on the Drawings.

M. Phase identification letters; in readily visible locations, shall be stamped into the main bus bars of switchboards and panelboards.

N. On the exterior door of each vault or other room or enclosure containing equipment operating over 600 volts, provide a vitreous enameled metal sign, red on white, reading "Danger - High Voltage".

O. In each switchboard room, electrical closet, or other space containing electrical equipment, provide a vitreous enameled metal sign, red on white, reading "Electrical Equipment Room - No Storage Permitted". Signs shall be mounted at clearly visible locations within the rooms or on the inside of doors where wall space within the room is not available.

P. In main switchboard rooms install a framed behind-glass blackline print of the field record feeder diagram complete with the feeder schedules.

3.5 MOUNTING HEIGHTS

A. Mounting heights of electrical items shall be as listed below, unless otherwise indicated. Dimensions are above finished floor, unless otherwise indicated. In areas where code requires different mounting heights, as in hazardous areas, comply with code requirements.

B. Indoor receptacle outlets in walls or partitions: 1'-6" to center line.

C. Toggle switch outlets: 4'-0" to center line.

D. Motor starters: 5'-0" to center line.

E. Disconnect switches: 5'-0" to center line.

F. Panels: 6'-0" to center line of highest handle, or per code.

G. Thermostats: 5'-0" to center line.

3.6 PROTECTION

A. Protect conduit and wireway openings against the entrance of foreign matter by means of plugs or caps. Cover fixtures, materials, equipment and devices furnished or installed under this section or otherwise protect against damage, both before and after installation. Fixtures, materials, equipment, or devices damaged prior to final acceptance of the work shall be restored to their original condition or replaced.

B. Equipment shall be inherently safe and moving parts shall be covered with guards.

3.7 TESTING

A. General: Furnish meters, instruments, cable connections, equipment or apparatus necessary for making all tests.

B. Insulation Tests:

1. After being pulled in place and before being connected, test all service and feeder cables with 1000 volt, 60 Hz insulation tester for one minute to determine that conductor insulation resistance to ground is not less than that recommended by the manufacturer. Test all branch circuit conductors for lighting, receptacle and miscellaneous loads prior to connection of loads. Tests shall not register less than one megohm to ground during an insulation test as described above for service and feeder cables. Remove, replace and retest all cable failing insulation test
2. Measure insulation resistance of electrical wiring with a self-contained instrument such as a direct-indicating ohmmeter of the generator, battery or electronic type.
3. When using any type of d-c voltage source, it is essential that the output voltage is steady to prevent fluctuation in charging current. Where protective resistors are used in test instruments, take into account their effect on the magnitude of the voltage applied to the insulation under test. Properly maintain the instrument used in insulation resistant testing. Make periodic checks to insure that rated voltage is delivered and that the instrument is in calibration.
4. Unless otherwise specified, the insulation resistance shall be approximately one megohm for each 1000 volts of operating voltage with a minimum value of one megohm.

C. Test all motors under load, with ammeter readings taken in each phase and the RPM of motors recorded at the time. Test all motors for correct direction of rotation.

D. Documentation: Keep records of all tests, in tabulated, permanent, reproducible form, completely indexed and explained, indicating the specific test performed, environmental conditions such as temperature and humidity, date of performance, results obtained, corrective actions taken (if any), final results, and comments if required. Copies of all tests shall be delivered to the Owner prior to the final project review.

3.8 MECHANICAL/ELECTRICAL COORDINATION

A. Factory-Wired Panel Includes:

1. FWP does not always mean wired at factory; but does mean provided as part of equipment package, and ready for final control and power connections.
2. Integrated control panel includes switches, starters, disconnects, protective devices and control transformers; all mounted on associated mechanical equipment
3. When motors or controls are not indicated on Electrical Drawings, these motors and controls are part of FWP equipment package; or control wiring will be run by Contractor providing equipment.
4. Responsibility: Contractor(s) providing equipment

B. Power Wiring Includes:

1. All circuitry carrying electrical energy from panelboard or other central distribution point to motor through motor starter protection device and disconnect, or to main terminals in FWP; and all final connections.
2. Additional conduit and wiring to remote devices indicated on Electrical Drawings.
3. Responsibility: Contractor for Division 26.

C. Equipment Motors and Control Wiring Includes:

1. Motors specified as part of equipment, including control wiring (120V) and interlock wiring; and all electric motors and control devices not indicated on Electrical Drawings.
    a. Motor type: Energy-efficient type; minimum 1.15 service factor on general-purpose motors; rated at 90 degrees C. ambient temperature (Class B insulation) with 40 degrees C. temperature rise.
    b. Multiple Speed Motors: Multiple windings.
    c. Motors 1/2 HP and under: Suitable for 120/1/60 except as scheduled otherwise.
    d. Motors over 1/2 HP: Suitable for 3 phase except as specified or scheduled otherwise; voltage indicated.

e. Motor Efficiency: Tested in accordance with IEEE Standard 112, test Method B, using accuracy improvement by segregated loss determination including stray load loss improvement as specified in NEMA MGl-12.53a.

2. Electrical conduit, wire and connections related to mechanical equipment controls; and not indicted on Electrical Drawings.
3. Magnetic motor starters when part of equipment control package; and wiring associated with starter holding coils.
4. Complete list of equipment and locations requiring electrical connections; all wiring diagrams; designation of motor terminal locations.
5. Responsibility: Contractor providing equipment and its motors.
6. Electrical Connections:
   a. Make electrical connections in accordance with equipment manufacturer's instructions.
   b. Make conduit connections to equipment using flexible conduit Use liquid-tight flexible conduit with water tight connectors in damp or wet locations.
   c. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment
   d. Provide receptacle outlet where connection with attachment plug is indicated. Provide cord and cap where field-supplied attachment plug is indicated.
   e. Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
   f. Install disconnect switches, controllers, control stations, and control devices as indicated.
   g. Modify equipment control wiring with terminal block jumpers as indicated.
   h. Provide interconnecting conduit and wiring between devices and equipment where indicated.
   i. Determine connection locations and requirements.
   j. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.
   k. Sequence electrical connections to coordinate with start-up schedule for equipment.

D. General Mechanical Wiring includes:

1. Wiring not indicated on Electrical Drawings including electrically operated sensors, flow switches, remote monitoring panels, remote control modules, detectors, pressure controllers, and automatic temperature control that are part of specified control systems.

3.9 OPENINGS, SLEEVES AND CHASES

A. Electrical Contractor Provides:

1. All opening and hole information through floors, walls, and roofs for his work; including all pipe and conduit, inserts, hangers, and plates; and all flashing and sealant for those openings and holes.
2. Exact information to other Contractors as to size, depth, and location of such openings before construction is in place; and delivery and setting in place of all boxes, sleeves, inserts, and forms for his work in time for installation in all locations.
3. All cutting, patching and restoration to accommodate Electrical Contractor's failure to provide specified data in time for openings to be left or to accommodate boxes, sleeves, inserts or forms after construction has been completed by other Contractors.
4. Skilled craftsman to cut, patch, rebuild, restore, replace, refinish and repaint new construction cut, disturbed, or marred by him to original or new condition; for installation of new, exposed, concealed, underground, or underfloor work of all kinds; for admission of new work and equipment; for installation of new equipment and new work in new construction; for complete restoration of pipe, duct, or equipment covering disturbed or marred by his personnel.
5. Cutting:
   a. Use core drill or radial saw with approved methods.
   b. Cutting of lintels, structural steel, or reinforcement not permitted.

3.10 PATCHING AND REPAIR

A. Where this contractor has removed equipment, devices, fittings, conduits, raceways, etc., they shall patch existing construction and finishes to match existing or as directed by the Architect/Engineer.

END OF SECTION 260500

SECTION 26 20 00 – ELECTRICAL DISTRIBUTION EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Provide items, articles, materials, operations, and methods required by the drawings and specifications including labor, equipment, supplies and incidentals necessary for completion of the work in Division 26.

B. The following is an index of the items listed in this section:

1. Raceways
2. Wires and Cables
3. Joints, Taps, and Splices
4. Grounding
5. Boxes and Handholes
6. Wiring Devices
7. Circuit Breakers and Disconnects
8. Motor Starters
9. Supporting Devices
10. Corrosion Prevention
11. Fuses
12. Equipment Bases
13. Vibration Isolation

C. The general provisions of the contract, including conditions of the contract and front end divisions of the specifications apply to the work in this Section.

D. This section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.3 REGULATORY REQUIREMENTS

A. NFPA 70-2020, National Electrical Code (NEC).

B. National Electrical Contractor’s Association, NECA: Comply with specified portions of NECA, Standard of Installation.

C. National Electrical Manufacturer's Association, NEMA:

1. Enclosures: Publication 250.
   a. Type 1: Indoor use, atmospheric conditions normal.
   b. Type 3R: Outdoor use, for protection against wind blown dust and rain, sleet, and external ice formation.
   c. Type 4X: Indoor and outdoor use, dust tight, corrosion - resistant.
2. PB. 1: Panelboards.

3. PB. 1.1: Instructions for Safe installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
4. PB2: Deadfront Distribution switchboards.
5. PB 2.1: Instructions for Safe handling, installation and Maintenance of Deadfront Distribution switchboards, rated 600 V or less.
6. WD 6: Wiring device configurations.
7. RN-I: Polyvinyl-Chloride Externally Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing.

D. Underwriter's Laboratories, UL:

All basic materials listed and labeled by UL.
UL 879: Wireways, Auxiliary Gutters & Associated Fittings.
UL 467: Grounding and Bonding equipment.
UL 857: Safety Standard.
UL 891: Deadfront Electrical switchboards.
UL 651: Rigid Non-Metallic Conduit

E. American National Standards Institute, ANSI:

1. ANSI C80. 1: Specification for Rigid Steel conduit, Zinc Coated.
2. ANSI C80.3: Specification for Electrical Metallic Tubing, Zinc Coated.
3. ANSI FB 1: Fittings & Supports for Conduit and Cable Assemblies.

F. Institute of Electrical and Electronic Engineers, IEEE: Comply with specified IEEE Standards for electrical grounding.

G. Occupational Safety and Health Administration: Comply with Federal standards for workplace safety.

PART 2 - PRODUCTS

2.1 RACEWAYS

A. Conduit
1. Provide complete metal raceway systems and enclosures for all wiring throughout the extent of the systems specified.
2. Conduits shall be 3/4" minimum size, unless indicated otherwise.
3. Electrical metallic tubing (EMT) "thinwall" conduit shall be 2" and smaller, unless otherwise indicated. EMT shall be hot-lipped galvanized or electro-galvanized steel.
4. Intermediate grade conduit (IMC) and galvanized rigid steel (GRS) shall be hot-dipped galvanized or electro-galvanized steel.
5. Conduits 2-1/2" and larger may, at the contractor's option, be Allied Tube and Conduit "KWIK-Couple."

6. Steel conduit manufacturers: Allied, LTV Steel and Wheatland. Conduit that shows corrosion within the 1-year guarantee period shall be replaced.
7. IMC and GRS conduit runs shall be made up with threaded joints and fittings.
8. EMT connectors and couplings shall be of the following types as required for the installation:
    a. Compression for 1/2" to 4".
    b. Set screw for 1/2" to 4".
9. Conduit and EMT fittings shall be made of steel or malleable iron.
10. Indenter type fittings or die-cast fillings of pot metal shall not be accepted.
11. Box connectors shall be the insulated throat type for 1" trade size, and smaller for all low voltage wiring.
    a. Manufacturers Conduit Fittings:
        1) Appleton
        2) Crouse-Hinds
        3) O.Z./Gedney
        4) RACO
        5) Steel City
        6) T&B
        7) Or approved equal
12. Flexible metallic tubing (FMT) shall be listed for use in air-handling plenums and be limited to 3/8" trade size. Flexible metallic tube fittings shall be used with FMT.
    a. Manufacturers FMT:
        1) Anamet Electrical
        2) Electri- Flex Company
        3) Or approved equal
    b. Manufacturers FMT-Fittings:
        1) Liquid Tight Connector Co.
        2) Or approved equal
13. Flexible metal conduit (FMC) shall be UL listed and limited to 1/2" through 4" trade size. Flexible metal conduit connectors shall be of malleable iron or steel construction and shall be U.L. 514 listed as a grounding means.
    a. Manufacturers FMC:
        1) Anamet Electrical
        2) Electri-Flex Co.
        3) International Metal Hose Co.
        4) Or approved equal
    b. Manufacturers FMC Connectors:
        1) Appleton Electric Co.
        2) Crouse-Hinds/Cooper Ind.
        3) Hubbell Elec. Prod./RACO
        4) O.Z./Gedney
        5) Thomas & Bells Corp.
        6) Or approved equal

14. Liquid tight flexible metal conduit (LFMC) shall be UL 360 listed and limited to 1/2" through 4" trade size. LFMC shall have an oil and moisture proof PVC jacket extruded onto an interlocked galvanized steel core. LFMC connectors shall be of malleable iron or steel construction and shall be UL 514 listed as a grounding means. Connectors 1" trade size and smaller shall be the insulated throat type.
    a. Manufacturers LFMC:
        1) Anamet Electrical
        2) Electri-Flex Co.
        3) International Metal Hose Co.
        4) Or approved equal
    b. Manufacturers LFMC Connectors:
        1) Appleton Electric Co.
        2) Crouse-Hinds/Cooper lnd.
        3) Hubbell Elec. Prod. /RACO
        4) O.Z./Gedney
        5) Thomas & Betts Corp.
        6) Or approved equal
15. Rigid non-metallic conduit. (PVC)
    a. PVC electrical conduit shall be manufactured to conform to UL651, ANSI/NEMA TC-2 specification, Federal Military Specification WC-1094A. It shall be UL listed for use in accordance with NEC Article 347.
    b. Conduit shall be suitable for direct burial, concrete encasement, above ground, and exposed uses.
    c. Conduit shall be schedule 40 heavy wall, 90 wire rated, and sunlight resistant.
    d. Use on this project shall be as detailed on the plans.
16. Bushings:
    a. Manufacturers:
        1) Appleton Electric Co. Series BU50l
        2) O.Z./Gedney Series lBC-50
        3) Thomas & Bells Series 1222
        4) Or approved equal
    b. Bushings for 1/2" conduit and larger shall be steel or malleable iron body with 105 degrees C insulating ring. Insulating material shall be locked in place and non-removable.
    c. Grounding bushings for conduit 112" and larger shall be malleable iron body with 105 degree C non-removable insulating ring and lay-in solderless lug.
    d. Threaded Type - Manufacturers:
        1) Appleton Electric Co. Model: Series GIB-L
        2) O.Z./Gedney Model: Type BLG
        3) Thomas & Betts Model: Series BG
        4) Or approved equal
    e. Set Screw Type - Manufacturers:
        1) Appleton Electric Co. Model: Series GIB-SL

2) O.Z./Gedney Model: Type SBLG
3) Thomas & Betts Model: Series BG
4) Or approved equal

17. Conduit Seals: Filled with compound as recommended by manufacturer. Seals shall be:
    a. Adelet
    b. Crouse-Hinds Model: EYS or EZS
    c. Appleton Electric Co. Model: ESUF or ESUM
    d. Killark Model: EY or EYS
    e. Or approved equal
18. Expansion Fillings: provide a suitable expansion filling in each concealed or exposed electrical raceway crossing a building expansion joint. Fittings shall be complete with bonding jumper and clamps.
    a. Manufacturers:
        1) O.Z./Gedney
        2) Crouse-Hinds
        3) Appleton Electric Co.
        4) Or approved equal
    b. Surface Metal Raceway:
        1) Manufacturers: Wiremold Co., Model 4000.
        2) Description: Two-piece steel surface raceway with divider.
        3) Size: As shown on Drawings.
        4) Finish: Gray.
        5) Fillings, Boxes and Extension Rings: Furnish manufacturer's standard accessories.
        6) Or approved equal

2.2 WIRES AND CABLES

A. Building Wiring: 98% conductivity copper, 600 volt insulation, Type THHN/THWN.

B. Branch Circuit Wiring: Conductors smaller than No. 12 AWG not permitted, except as noted.

C. Exterior Wiring: Type THWN and/or XHHW to comply with NEC for wet location wiring.

D. Joints and Splices: UL approved.

E. Wiring for Systems Other Than Power Conform to system manufacturer standards as to size, type and coding, subject to specified minimums.

1. Size conduit as required by system manufacturer, but no smaller than 1/2".

F. Provide permanent plastic nametag indicating load fed.

G. Color code conductors to designate neutral conductor and phase.

2.3 JOINTS, TAPS AND SPLICES

A. All materials and devices for joints, taps and splices shall be rated 600V, U.L. listed and flame retardant.

B. #8 AWG and Smaller Joints in Dry or Damp Locations: Use twist-on connectors with plated steel, square wire live spring and 105 degrees C thermoplastic or PVC shell.

1. Manufacturers:
   a. Buchanan Model: B-Cap
   b. Ideal Model: Wing Nut
   c. 3M Model: Ranger
   d. T & B Model: Marrettes
   e. Or approved equal

C. #8 AWG and Smaller Joints in Wet or Submersible Locations: Use twist-on connectors filled with waterproof/corrosion proof sealant, plated steel, square wire live spring and 105 degrees C thermoplastic shell.

1. Manufacturers:
   a. Buchanan
   b. Ideal
   c. King Safety Products
   d. Or approved equal

D. #6 Awg and Larger Joints Above Grade, Dry Locations Only: Use self-insulated, conductor insulation piercing, bolted connector, dual rated for copper and aluminum wire, field modifiable for use as a tap splice.

1. Manufacturers:
   a. Blackburn Model: Talon
   b. Burndy Model: BIPC
   c. ILSCO Model: KUP-L-TAP
   d. Or approved equal

E. #6 AWG and Larger Taps Below Grade, Damp and Wet Locations: Use parallel tap compression connector with manufacturer recommended insulation cover, high conductivity aluminum with corrosion resistant finish, minimum 600V, 90 degrees C. Connector shall be filled with antioxidant joint compound. Dual rated for both bare copper and aluminum wire.

1. Manufacturers:
   a. Bumdy Model: H-Crimpit
   b. Panduit Model: H Type

c. T & B Model: HT Series
d. Or approved equal

F. #6 AWG and Larger Splices Below Grade, Damp and Wet Locations: Use two-way splice connector and heat-shrinkable insulators internally coated with moisture resistant sealant. Connector shall be made of high conductivity aluminum with corrosion resistant finish, minimum 600V, 90 degrees C dual rated for both bare copper and aluminum wire. Connector shall be factory pre-filled with antioxidant joint compound.

1. Manufacturers:
   a. Bumdy Model: Hylink
   b. Panduit Model: SA Type
   c. T&B Model: 60500 Series
   d. Or approved equal

2.4 GROUNDING

A. All ground conductors shall be identified by the color green and shall be the same size and insulation type as the phase conductors or as sized on the plans.

B. Ground conductors are to have 600-volt insulation. They shall be solely used for grounding purposes and entirely separate from white grounded neutral conductor. Provide separate, insulated conductor within each feeder and brach circuit raceway and terminate each end on suitable lug, bus, or bushing.

C. Raceway Grounding:

1. Ground conduit systems, use double lock nuts at panels, use bonding jumpers if conduits are installed in concentric or eccentric knockouts.
2. Parallel flexible steel conduits with copper jumper, sized in accordance with NEC 2020. Securely fasten one end of jumper to rigid metallic conduit or connector, other end to device served.
3. Provide all boxes for proposed devices with grounding screws. Provide all panelboard, equipment enclosures with grounding conductors that enter their respective enclosures.

D. Equipment Grounding:

1. Ground separately mounted controllers, equipment frames, panels, switches, and outlets through the use of separately run conductors. Use of grounded conduit system shall not be considered adequate grounding.
2. Equipment grounding lugs: Clamp-type, high conductivity copper alloy. Burndy, ILSCO, or O.Z. gedney.

E. Utility Service Grounding:

1. Existing exterior ground grid to be re-used.

2.5 BOXES AND HANDHOLES

A. Manufacturers:

1. Appleton Electric Co.
2. Crouse-Hinds.
3. Harvey Hubbell, Inc.
4. Hoffman Engineering Co.
5. Lew Electric Fitting Co.
6. O.Z./Gedney Co.
7. Thomas & Bells Co., Inc.
8. Or approved equal

B. General: Boxes in plenums shall be in accordance with applicable code.

C. Outlet Boxes: Hot dipped galvanized, 1.25 oz. per sq. ft. Handy boxes, sectional and switch boxes shall not be accepted.

1. Interior Boxes Lab and Old Pump Building: Pressed (drawn) sheet steel, 4" square by 1-1/2" or 2-1/2" deep, with knockouts for conduit; attached lugs for location.
2. Exterior Boxes: cast aluminum, deep type, corrosion- proof fasteners, water tight, gasketed, with threaded hubs.
3. Interior exposed boxes treatment areas shall be NEMA 4X cast boxes. Boxes shall be provided with a screw on cover of the same material. Covers shall be gasketed.
4. Ceiling Boxes: 4" octagon boxes for 1 fixture; including fixture studs and maximum 2 connecting conduits.
5. Flush Mounted in Walls:
   a. Boxes with matching plaster cover for single or two gang outlets.
   b. Two-gang box or larger for conductors, conductor joints, conduit terminations and wiring devices.
6. Surface Mounted: 4" square with raised metal cover.

D. Pull Boxes and Junction Boxes: NEC metal construction with screw-on or hinged cover.

1. Flush Mounted Pull Boxes: Overlapping covers with flush- head cover retaining screws; prime coated.

E. Conduit Bodies:

1. Galvanized cast-metal of type, shape and size to fit each location.
2. Constructed with threaded conduit ends, gasketed, removable cover and corrosion-resistant screws.

F. Bushings, Knockout Closures and Locknuts: Corrosion-resistant punched-steel box knockout closures, conduit locknuts and insulated metallic conduit bushings, type and size to suit each use.

G. Exterior Handholes:

1. Polymer concrete body with open bottom, polymer concrete lid with gasket and stainless-steel hardware, mounted flush with finished grade.
2. Label lid as “Electric”.
3. Size as required for connections and coordinate conduit stub-up locations with site layout.

2.6 WIRING DEVICES

A. Wall Switches: 120/277 volt, rated at 20 amps. Color ivory or selected by Architect or Owner.

1. Manufacturers:
   a. Arrow Hart Model: 1991
   b. Hubbell, Inc. Model: CS1221
   c. P & S Model: 20AC1
   d. Or approved equal

B. Receptacles: 125 volt, rated at 20 amps, NEMA5-20. Color ivory or selected by Architect or Owner.

1. Receptacles Manufacturers:
   a. Arrow Hart Model: 5352
   b. Hubbell, Inc. Model: CR5362
   c. P & S Model: 5352
   d. Or approved equal

2. Ground Fault Circuit Interrupter Manufacturers:
   a. Arrow Hart Model: GF5342
   b. Hubbell, Inc. Model: GF5362
   c. P & S Model: 2091-S
   d. Or approved equal

3. Surge Suppressor Manufacturers:
   a. Arrow Hart Model: lG8300-SI
   b. Hubbell, Inc. Model: lG5352S

c. P & S Model: 1G6362-SP
d. Or approved equal

C. Plate Covers:

1. Manufacturers:
   a. Arrow Hart
   b. Hubbell, Inc.
   c. Mulberry Metal Products, Inc.
   d. P&S
   e. Or approved equal
2. Materials: Thermo-plastic, color to match device.
3. Flush Mounting Plates: Beveled type with smooth rolled outer edge.
4. Surface Box Plates: Beveled, steel, pressure formed for smooth edge to fit box.
5. Kitchen/Food Concession Areas: Stainless steel type 302/304, 0.035" thick, satin finish with smooth rolled outer edge.
6. Damp Location Plates: Cast metal or plastic, gasketed; provide spring-loaded gasketed doors for receptacles as per NEC 410-57(a).
7. Wet Location Plates/Enclosures: Cast metal or plastic dual gasketed hinged outlet cover/enclosure deafly marked "Suitable For Wet Locations While In Use" and "U.L. Listed" for use as per NEC 410-57(b).
   a. Manufacturers: Tay Mac Specification Grade or Engineer approved equivalent.

2.7 CIRCUIT BREAKERS AND DISCONNECTS

A. Disconnect Manufacturers:

1. Allen Bradley
2. Cutler-Hammer
3. Siemens I-T-E
4. Square D Co.
5. ABB
6. Or approved equal

B. Safety Switches: Heavy-duty type.

1. Sheet steel enclosed safety switches, size and electrical characteristics indicated, surface mounted, fusible or nonfused as indicated, rated at 600 volts.
2. Quick-make, quick-break type, constructed so switch blades are visible in OFF position with door open.
3. Operating handle as integral part of enclosure base, easily recognizable position, pad-lockable in OFF position.
4. Current carrying parts constructed of high-conductivity copper and silver-tungsten type switch contact

5. Positive pressure type reinforced fuse clips.
6. Provide factory installed equipment ground kit.
7. Enclosures:
    a. Outdoors: NEMA Type 3R.
    b. Elsewhere: NEMA Type 4X.

C. Circuit Breakers

1. Bolt-on, molded case automatic circuit breakers with thermal and magnetic trip and tri-free position separate either On or Off position.
2. New circuit breakers shall be installed in existing panelboards and shall match the manufacturer of the panelboard.
3. Existing panelboards:
    a. HV: Cutler-Hammer PRL-2A, 277/480V 3PH 4W 200A
    b. LV: Cutler-Hammer PRL-1A, 120/208V 3PH 4W 100A
    c. Update directory in each existing panelboard to identify newly installed circuit breakers and branch feeders.

2.8 MOTOR STARTERS

A. Manufacturers:

1. Allen Bradley Co.
2. Cutler-Hammer
3. Siemens I-T-E
4. Square D Co.
5. ABB
6. Or approved equal

B. Single-Phase Motor Starters: Surface type.

1. Manual Type: Toggle operated with 1 or 2 poles, thermal overload elements, and pilot light.
2. Magnetic Type: With 1 or 2 poles and thermal elements.
    a. 120 volt coil, manual reset, and minimum 1 N.O. auxiliary contact.
    b. Control transformer, when 120 volts to neutral is not supplied obtains 120 volts with 1 secondary line fused and other line grounded.
    c. HAND/OFF/AUTO selector switch and red pilot light in cover.

C. Three-Phase Motor Starters: Manual or combination magnetic starter as indicated on Drawings, with 3 thermal overload elements.

1. Magnetic Starters: Full voltage combination type.

    a. 120 volt coil, manual reset, and minimum 1 N.O. auxiliary contact.

b. Control transformer, when 120 volts with 1 secondary line fused and other line grounded.
c. HAND/OFF/AUTO selector switch and red pilot light in cover.
d. Phase loss protection.

2. Other modifications indicated on Drawings.

D. Motor Protection: Integral with motor starter, thermal type, including manual reset.

1. Automatic reset type overloads or built-in overloads not acceptable.
2. Provide motor protection for each speed of multiple speed motors.

E. Enclosures:

1. Indoors: NEMA Type 1
2. Outdoors: NEMA Type 3R.
3. Elsewhere: NEMA Type 4X

F. Magnetic Starter Control Stations: All controls 120V or less.

1. Control Stations: Oil-tight with push-buttons, selector switches, pilot lights.
2. Push-button: Recessed and surface mounted; stainless steel or suitable cover plates

G. Variable Frequency Motor Controllers:

1. Refer to irrigation system specifications for packaged equipment information and requirements.

2.9 SUPPORTING DEVICES

A. Locations:

1. Anchor bolts, sleeves, inserts, hangers and supports required for the Electrical work shall be furnished and installed under Division 16.
2. Coordinate with other trades the locations of anchors, sleeves, inserts and supports and insure that they are properly installed.
3. Openings and sleeves shall be set true to line, level, plumb and position and shall be so maintained during construction. Where sleeves and openings are provided in poured concrete, inspect same during and after concrete is poured to insure proper position and correct any deviation.

B. Hangers and Supports:

1. Provide hangers, angles, channels, and other supports required by field conditions to install items of electrical equipment. Design of supports and methods of fastening to building structure shall be acceptable to the Engineer. Provide spring hangers for vertical raceway supports.
2. Use of powder-actuated fasteners and devices is permitted with the following requirements:
    a. Fasteners shall be applied with low velocity tool.
    b. Load capacity per fastener (9/64" shank diameter):
        1) For 1" penetration in concrete, 125 lbs. per fastener.
        2) For 1-3/4" penetration in concrete, 225 lbs. per fastener.
    c. Fasteners shall be located in thickest part of slab.
    d. Devices shall comply with OSHA requirements.
3. Use of lead shield expansion anchors is not permitted.
4. No electrical items shall rest on, or depend for support on, suspended ceiling media (tiles, lath, plaster, splines, etc.)
5. In suspended ceilings, support conduits directly from structural slabs, decks (or framing members.) Do not support conduits on ceiling suspension members.
6. Support surface or pendant lighting fixtures:
    a. From an outlet box by means of an interposed metal strap, where weight is less than 5 lbs.
    b. From an outlet box by means of a hickey or other direct threaded connection, where weight is from 5 to 50 lbs.
    c. Directly from structural slab, deck or framing member, where weight exceeds 50 lbs.
7. Support recessed lighting fixtures:
    a. From ceiling suspension members, where weight is less than 60 lbs.
    b. Directly from structural slab, deck or framing member, where weight is 60 lbs. or more.
8. Provide weight-distribution facilities, where required so as not to exceed the load-bearing capabilities of floors or walls that bear the weight of, or support, electrical items.
9. For point-of-attachment weight of 100 lbs. or less, fasten items as follows:
    a. On wood, use wood screws.
    b. On concrete and solid masonry that is already in place, use self-drilling concrete anchors or expansion bolt and couplings.
    c. On hollow construction, use toggle bolts.
    d. On solid metal, use machine screws in tapped holes, or welded studs.
    e. On structural steel, use beam clamps.
10. For point-of-attachment weights from 100 lbs. to 300 lbs. provide supports as follows:

a. At cast-in-place concrete slabs, use concrete inserts in bottom of slab, with 1/8" slip-through steel rods set transverse to the reinforcing steel.
b. At concrete slab already in place, use 16" x 8" x 1/2" steel plates at top of slab, with through bolts welded in place. The plates shall be chased in and grouted flush, where no fill is to be applied.

11. For point-of-attachment weights over 300 lbs., provide supports as follows:
    a. At cast-in-place concrete slabs, use 16" x 8" x 1/2" steel plate, with through bolts welded in place. Top of plate shall be 1-1/2" below top of slab, or on top of slab where a fill slab is to be installed.
12. Hangers and supports shall be hot dipped galvanized, unless noted otherwise.
13. Equipment shall not be held in place by its own dead weight Provide base anchor fasteners in each case.
14. Trapeze type hangers may be used where several conduits are to be installed at the same elevation. The spacing of such trapeze hangers shall be in accordance with the NEC for the smallest conduit in the run.
15. Vertical conduits shall be supported by heavy wrought iron clamps or collars anchored to construction at each floor.

C. Sleeves and Openings:

1. Provide sleeves for conduit where they pass through walls or floors.
2. Sleeves shall be not less than 1" larger than outside dimension of raceways.
3. Floor sleeves shall be galvanized steel pipe stubbed 3" above floor. Unused sleeves shall be capped.
4. Provide 3" high concrete curbs around openings through floors.
5. Sleeves through equipment room walls and floors, sound rooms, private offices, classrooms and similar quiet areas shall have the net openings packed with glass fiber insulation and both ends of sleeve caulked with waterproof mastic to prevent noise, dirt, air, fire, smoke and water transmission. Match the fire rating of the surrounding construction. The utility companies shall pack the inside of their sleeves.
6. Where conduits pass through floors or exterior walls, caulk sleeves with oakum and lead. Wool at both ends to insure waterproofing around pipe.
7. Where conduits pass through foundation walls, provide entrance seals, Link Seal wall sleeve type "WS" and seal type "LS", O.Z./Gedney type WSK or CSM, or approved equal, as applicable. For sealing of wires provide O.Z./Gedney type CSB, or approved equal, unless noted otherwise.

8. Where conduits penetrate the roof, provide a pipe/conduit flashing system consisting of, but not limited to, a galvanized steel roof curb with integral base and continuously welded seams, rigid fiberglass insulation, wood nailer and pre-punched plastic curb cover with sealing ring and collard opening. Provide an EPDM molded rubber cap to accommodate the size and number of conduits. Seal each nipple to the conduit with the stainless steel adjustable band clamps provided.
    a. Manufacturers:
        1) The Pate Company
        2) Thycurb
        3) Roof Products & Systems Corp.
        4) Or approved equal

D. Inserts:

1. Manufacturers:
    a. Barrett
    b. Crawford
    c. Elecn
    d. Unistrut
    e. Grinnel
    d. Or approved equal
2. Inserts for suspended items in poured concrete construction shall be malleable-iron concrete inserts, adjustable type with insert nut.
3. Inserts for surface mounted items shall be suitable for the composition of the slab, wall, or structure on which installation is to be made.

E. Fixture Supports and Hangers:

1. Each lighting fixture shall be rigidly supported from the building construction and shall include suspension hangers, devices and extra steel work for fixture support where required.
2. Coordinate with the ceiling work to determine modifications required to make fixtures suitable for ceiling installation. Verify the types of ceiling construction prior to fixture fabrication. Determine that suspension method and flange arrangement for the fixtures coordinate with the ceiling type and its suspended system. Fixtures which are shipped to the project but do not fit or otherwise match the ceiling system shall be returned for correction at no additional cost to Owner.
3. Recessed fixtures shall be provided with the proper plaster frame or suitable adapter to receive the finished ceiling construction.
4. Where suspended ceilings with steel channels occur, outlets and fixtures shall be supported on members resting on the channel framework. In no case shall fixtures be supported from plasterboard, plaster or acoustic material.

2.10 CORROSION PREVENTION

A. Protect all metallic materials against corrosion.

1. All equipment enclosures given rust-inhibiting treatment and standard finish by manufacturer.
2. Ferrous Metal Parts: Hot dip galvanized, ASTM A123 or ASTM Al 53.
   a. Includes anchors, bolts, braces, boxes, bodies, clamps, fillings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous parts; other than stainless steel or nonferrous materials.

B. Isolation of Dissimilar Metals: Separate dissimilar metals with NEC approved material.

2.11 FUSES

A. Manufacturers

1. Bussmann
2. Littelfuse
3. Gould Shawmut
4. Or approved equal

B. UL Class RK1, rejection type, dual-element type, 10-second time delay, 500% overload, 1/10 to 60 amp current rating with 200,000 amp interrupting rating.

C. UL Class L, time-delay, current-limiting, over 600 amp current rating, with 200,000 amp interrupting rating.

2.12 EQUIPMENT BASES

A. Provide 2” high concrete pads for floor mounted electrical equipment. The edge of the concrete pads shall have ¼” chamfer. The pad dimensions shall be 1” greater on each side than the floor dimensions of the electrical equipment.

B. Concrete pads shall be complete with steel reinforcing and necessary bolts, anchors, its. Where concrete pad is set directly on concrete floor, dowels in floor to tie base to floor shall be provided.

2.13 VIBRATION ISOLATION

A. Manufacturers:

1. Barry Division of Barry Wright Corp.
2. Consolidated Kinetics Corp.
3. Mason Industries

4. Or approved equal

B. Suspended vibration producing equipment shall have spring elements in the hanger rods or isolation pads under the equipment.

C. Conduit connections to vibration producing equipment shall be made with flexible conduit.

PART 3 - EXECUTION

3.1 INTERFERENCES

A. Coordinate work of this Division with other Divisions so that interference between piping, equipment, structural and electrical work will be avoided.

B. In case interference develops, Architect/Engineer will decide which equipment will be relocated; regardless of which apparatus was installed first

C. Provide UL approved expansion fillings where materials cross building expansion joints.

3.2 MECHANICAL/ELECTRICAL COORDINATION

A. Factory Wired Panel (FWP): Furnished and installed under Sections of Division 16. FWP does not always mean wired at factory; but does mean provided as integral part of equipment package and a totally wired control system.

3.3 RACEWAYS

A. Material Schedule:

1. Above-Grade Interior Locations: Electrical Metallic Tubing (EMT) with compression type fittings.
2. Underground: Polyvinyl Chloride (PVC) Schedule 40 with long sweep Rigid Galvanized Steel (RGS) elbows and water-tight fittings.
5. Exterior Exposed Locations: Rigid Galvanized Steel (RGS) or Intermediate Metallic Conduit (IMC) with threaded fittings.
6. Underfloor/In Slab: Rigid Galvanized Steel (RGS) and water-tight fittings.

B. Installation of Conduit:

1 Install conduit and tubing products indicated, in accordance with manufacturer's written instructions and the requirements of the NEC and NECA, Standard of Installation.

2. Joints in conduit run underground, exposed out-of-doors, or in slabs on grade shall be made watertight with copper based anti-corrosive conductive compound.
3. Conceal conduit in all areas excluding mechanical, electrical, and other unfinished rooms, connections to motors, and connections to surface cabinets.
4. All surface mounted conduits and tubing shall be securely supported within 1'6" of each outlet, junction box, cabinet or filling.
5. Attach conduit with clamps.
6. Flexible conduits shall not be secured to boxes, cabinets, enclosures or wireways by means of concentric or eccentric knockouts unless the conduit is securely fastened in place by an approved means within 12" of the connector.
7 Exposed conduit in unfinished areas, damp and wet locations, or in areas subject to corrosive agents, shall be supported every five (5) feet so that there is at least 1/4" air space between it and the wall or supporting surface.
8. Coordinate installation of conduit in partition work.
9. Install conduit free from dents and bruises.
10. Plug conduit ends to prevent entry of dirt or moisture.
11. Clean out conduit before installation of conductors.
12. Alter conduit muting to avoid structural obstructions, minimize cross-over, and where possible, install raceways above water and steam piping.
13. Allow minimum 6" clearance at steam pipes and heat sources.
14. Where portions of the conduit system are exposed to widely different temperatures, install conduit seals to prevent the circulation of air from a warmer to a colder section.
15. Route all exposed conduits parallel or perpendicular to building lines.
16. Seal opening around conduit with oakum, silicone sealant or fiberglass where conduits leave heated area and enter unheated area or non-fire rated partitions or ceilings.
17. Where rigid conduit or intermediate metal conduit is installed in cabinet, junction box, pull box, or outlet box, protect conductors with nylon insulated metallic bushing with locknut on inside of enclosure or insulating plastic bushing with locknut on both sides of enclosure. In damp or wet locations, utilize sealing locknuts.
18. Fire rated walls, partitions, floors, ceilings, penetrations: Sealed in accordance with NEC 300-21.
19. Connections:
    a. Motors and equipment: Minimum 1/2" size; PVC jacketed flexible conduit and liquid-tight connectors.
    b. Flexible conduit sufficient length to avoid vibration transmission.
    c. Fixture wiring only: 3/8" flexible conduit.
    d. Coordinate service conduit connections with utility company.
20. Roof Penetrations: Provide a manufactured pipe flashing system installed as per the manufacturer's recommendations for a complete weathertight/watertight installation.

21. Where roof curbs are installed by other divisions, route and coordinate conduit within curb to avoid roof penetrations.

C. Installation of Surface Raceways:

1. Install Products in accordance with manufacturer's instructions.
2. Install surface raceways in finished areas where conduit cannot be concealed.
3. All surface mounted raceways shall be securely supported within 1'6" of each outlet, junction box, cabinet or filling.
4. Use flat-head screws, clips, and straps to fasten raceway channel to surfaces. Mount plumb and level.
5. Use suitable insulating bushings and inserts at connections to outlets and corner fillings.
6. Close ends of raceways, wireways and unused conduit openings.
7. Ground and bond raceways and wireways.

3.4 WIRES AND CABLES

A. Make conductor length for parallel feeders identical.

B. Lace or clip groups of feeder conductors at pull boxes.

C. Conductor size indicated on Drawings indicates amperage requirements using copper conductors.

D. All conductors shall be solid or standard copper and minimum No. 12AWG except where noted in these Specifications and/or on the drawings. Standing of copper wires shall conform to ASTM B8 (Class B) “Concentric Lay-Standard Copper Conductors”.

E. The inside of conduit and raceways shall be dry and clean before cables are pulled. Care shall be exercised in pulling to avoid damage to the cable. An approved type of lubricant may be used.

F. A ground wire shall be installed in all non-metallic raceways in addition to number of wires shown. Wire shall be in accordance with NEC.

G. Cables terminating in outlet boxes shall be a minimum of eight (8”) inches long.

H. A ground wire shall be installed in all liquid-tight flexible conduits in addition to the number of wires shown.

I. Install wire and cable only in code conforming raceway.

J. Pulling: Use wire pulling lubricant for pulling #4 AWG and larger wire. Do not use pulling means, including fish tape, cable or rope, which can damage raceway.

K. Splicing: Splice only in accessible junction or outlet boxes.

1. Install splices and taps which have equivalent-or-better mechanical strength and insulation as conductor.
2. Use splice and tap connectors compatible with conductor material.
3. #8 and smaller joints: Use connectors specified with PVC or thermoplastic shell.
4. #6 and larger joints: Prepare wires and cables in accordance with the manufacturer's recommended materials and procedures.
5. Connectors which utilize torque to secure the connection shall be installed with a torque wrench to the value recommended by the manufacturer.
6. Compression connectors shall be installed with full cycle circumferential compression tools and precision dies. Utilize wire preparation materials and techniques as directed by the connector/tool manufacturer.
7. Joints, taps and splices in damp, wet or corrosive locations shall be insulated watertight with materials compatible with the conductor insulation, conductor/connector material and the environment in accordance with the manufacturer's recommendations.

L. Prior to energizing, check for continuity of circuits, and for short circuits.

M. Subsequent to wire and cable hook-ups, energize panel and demonstrate functioning in accordance with specifications.

N. Arrange feeders so that loads are balanced within ± 10% on all three phases.

O. Phase Identification: Branch circuit conductors shall be color-coded to differentiate the phases, the same color being assigned to the same phase throughout the job. Phase indication shall be as follows or similar as allowed by code.

3.5 BOXES AND HANDHOLES

A. Provide knockout closures to cap unused knockout holes where blanks have been removed.

B. Support all boxes independently of conduit

C. Outlet Boxes:

1. Flush mount outlet boxes in areas other than mechanical rooms, electrical rooms, and above removable ceilings.
2. Do not install boxes back-to-back in same wall.
3. Masonry Walls:
   a. Adjust position of outlets in finished masonry walls to suit masonry course lines.

b. Coordinate cutting of masonry walls to achieve neat openings for boxes.
c. Locate boxes in masonry walls so that only corner need be cut from masonry units.

4. Do not use sectional or handy boxes.
5. Adjust outlet mounting height to agree with specified location for equipment served.

D. Pull Boxes and Junction Boxes: Locate pull boxes and junction boxes above removable ceilings or in electrical rooms, utility rooms, or storage areas.

3.6 WIRING DEVICES

A. Wall Switches: For mounting requirements refer to "Basic Electrical Requirements" under "Mounting Heights".

1. Coordinate switch mounting location with architectural detail.

B. Receptacles: For mounting requirements refer to "Basic Electrical Requirements" under "Mounting Heights." Mount vertically with grounding pole at top.

1. When mounting height exceeds 27" above floor, mount horizontally with grounding pole at left.

3.7 CIRCUIT BREAKERS AND DISCONNECTS

A. Installation: In accordance with manufacturer's recommendations and NEC specifications.

B. Install disconnect switches used with motor-driven appliances, motors and controllers, within sight of controller position.

C. Install fuses as indicated.

D. Where motor is not in sight, or more than 50 feet from its controller, controller disconnecting means capable of being locked in OFF position; or manually operable disconnecting device in motor circuit is placed within sight from motor location.

E. Follow unit manufacturer's nameplate labeling for use of fuses or breakers as unit branch circuit protective device; in accordance with NEC 110-3 (b).

3.8 MOTOR STARTERS

A. Install motor starters and control stations control devices where indicated, and coordinate location with architectural drawings.

B. Install overload heaters correlated with full load current of motors provided.

C. All electric motors and control devices such as aquastats, float and pressure switches and electro-pneumatic switches will be furnished and mounted by Contractor furnishing equipment.

1. All such equipment completely wired under this Section.
2. Mount control devices in proper time and sequence to enable each Contractor to meet work schedule.

D. Mount and wire all controlling equipment furnished in Division 26.

E. Verify motor sizes for starters, including verification of specified number of auxiliary contacts.

F. Install all power and control wiring, including conduit, to starters and from starters to motors and to all remote devices specified, for complete system operation as indicated.

G. Install all motor starters, pilot lights, pushbuttons, selector switches, thermal overloads, and local disconnect switches at motors; except those devices specified as part of integral factory wired panels (FWP), or where furnished by Contractor furnishing equipment.

H. Drawings: Field wiring is indicated on Electrical Drawings. See Electrical or Mechanical Drawings for location of equipment and control devices.

3.09 SUPPORTING DEVICES

A. Installation: Maintain headroom, neat mechanical appearance, and support equipment loads specified.

3.10 CORROSION PREVENTION

A. Protect all materials against corrosion and isolate dissimilar materials.

END OF SECTION 262000

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cleaning site of debris, grass, trees, and other plant life in preparation for site or building earthwork.
   2. Protection of existing structures, trees, or vegetation indicated on the Construction Drawings to remain.

B. Related Requirements:
   1. Section 312000 – Grading
   2. Section 312500 - Erosion And Sedimentation Control

1.2 ENVIRONMENTAL REQUIREMENTS

A. Construct temporary erosion and sediment control systems as shown on Construction Drawings to protect adjacent properties and water resources from erosion and sedimentation.

B. In event that sitework on this project will disturb one or more acres, starting work shall be strictly governed by the sequence of construction as specified in Section 312500 and Erosion Control Plan. Contractor shall not begin construction without "National Pollution Discharge Elimination System" (NPDES) permit governing discharge of storm water from site for entire construction period. NPDES permit requires erosion control measures to be in place during construction.

C. Clearing and grubbing shall commence in the proper sequence as stated in the contract documents.

D. Contractor shall conduct storm water management practices in accordance with the project documents and applicable NPDES permit and shall enforce action taken or imposed by Federal or State agencies, including cost of fines, construction delays, and remedial actions resulting from Contractor's failure to comply with provisions of NPDES permit.

1.3 PROJECT CONDITIONS

A. Conditions existing at time of inspection for bidding purposes will be maintained by Owner as reasonably practical.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify existing plant life that is to remain and verify clearing limits are clearly tagged, identified, and marked in such manner as to ensure their protection throughout construction operations.

3.2 PROTECTION

A. Locate, identify, and protect existing utilities that are to remain.

B. Protect trees, plant growth, and features designated to remain as part of final landscaping.

C. Conduct operations with minimum interference to public or private accesses and facilities. Maintain ingress and egress at all times and clean or sweep roadways daily as required by contract documents or governing authority. Dust control shall be provided with sprinkling systems or equipment provided by Contractor.

D. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by a licensed land surveyor and replaced, as necessary, in kind.

E. Provide traffic control as required, in accordance with the US Department of Transportation's "Manual on Uniform Traffic Control Devices" and applicable state highway department requirements.

3.3 EQUIPMENT

A. Material shall be transported to and from the project site using well-maintained and operating vehicles. Transporting vehicles operating on site shall stay on designated haul roads and shall not endanger improvements by rutting, overloading, or pumping.

3.4 CLEARING

A. Clear areas required for access to site and execution of work.

B. Unless otherwise indicated on Construction Drawings, remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction. Removal includes digging out stumps and roots. Depressions caused by clearing and grubbing operations shall be filled to subgrade elevation to avoid ponding of water. Satisfactory fill material shall be placed in accordance with Section 312000.

C. Remove grass, trees, plant life, stumps, and other construction debris from site to dump site that is suitable for handling such material according to state laws and regulations.

D. Cut heavy growths of grass from areas before stripping and topsoil removal and remove cuttings with remainder of cleared vegetative material.

END OF SECTION 311000

SECTION 312000 - GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
Excavation, filling, and backfilling for structures and pavement.
Trenching and backfilling for utilities.
Dewatering.
Boring under crossings.

B. Related Requirements:
Section 313200- Soil Stabilization
Section 312500 - Erosion and Sedimentation Control
Section 313700 - Stone Protection

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. ASTM International (ASTM)
ASTM D422 - Particle Size Analysis of Soil.
ASTM D698 - Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN.m/m^3)).
ASTM D1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 Kn.m/m^3)).
ASTM D2487 - Classification of Soils for Engineering Purposes (Unified Soil Classification System).
ASTM D2488 - Description and Identification of Soils (Visual-Manual Procedures).
ASTM D4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
ASTM D6938 – In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

C. American Association of State Highway and Transportation Officials (AASHTO)
AASHTO T 88 - Particle Size Analysis of Soils.

D. State Department of Transportation (DOT):
Standard Specifications for Construction and Materials.

E. National Fire Protection Association (NFPA)
NFPA 70 - National Electrical Code.

1.3 DEFINITIONS

A. Satisfactory Materials: ASTM D2487 soil classification groups GW, GP, GM, SW, SP, SM, ML, CL, SC, GC, or a combination of these group symbols. Fill material shall further conform to the plasticity index and liquid limits (PI and LL) specified in Paragraph FILLING hereinafter. Satisfactory materials shall be free of rock or gravel larger than allowed for fill or backfill material as specified hereinafter or as shown on the drawings. Satisfactory materials shall contain no debris, waste, frozen materials, vegetation, and other deleterious matter.

B. Unsatisfactory Materials: Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory materials which contains root and other organic matter or frozen material. The CTL shall be notified of any contaminated materials. Unsatisfactory materials also include satisfactory materials not maintained within 2 percent of optimum moisture content at time of compaction.

1.4 SUBMITTALS

A. Submit 30-pound sample of each type of off-site fill material that is to be used at the site in airtight containers to the independent testing laboratory or submit gradation and certification of aggregate material that is to be used at the site to the independent testing laboratory for review.

B. Submit name of each material supplier and specific type and source of each material. Change in source throughout project requires approval of Owner.

C. Submit Dewatering Plans upon request by Owner.

D. Shop drawings or details pertaining to excavating and filling are not required unless otherwise shown on the Drawings or if contrary procedures to Construction Documents are proposed.

E. Shop drawings or details pertaining to site utilities are not required unless required by regulatory authorities or unless uses of materials, methods, equipment, or procedures that are contrary to The Drawings or Specifications are proposed. Do not perform work until Owner has accepted required shop drawings.

F. Contact utility companies and determine if additional easements will be required to complete project. Provide written confirmation of the status of all easements to Owner at time of Preconstruction Conference or no later than 90 days prior to project possession date.

PART 2 - PRODUCTS

2.1 SOIL AND ROCK MATERIALS

A. Fill and Backfill. Satisfactory materials excavated from the site.

B. Imported Fill Material: Satisfactory material provided from offsite borrow areas when sufficient satisfactory materials are not available from required excavations.

C. Trench Backfill: ASTM D2321 unless otherwise specified or shown on the drawings.

D. Bedding: Aggregate Type as indicated on the plans or naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No.200 sieve.

E. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No.8 sieve.

F. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No.4 sieve.

G. Topsoil: Topsoil shall consist of stripping the root mass material excavated from the site. Root mass shall consist of organic surficial layer found in top 2” to 3” depth.

2.2 APPURTENANT MATERIALS

A. Stabilization fabrics and geogrids: As specified in Section 313200.

B. Filter and drainage fabrics: As specified in IDOT Standard Specifications.

C. Steel Casing Pipe: Comply with AWWA C200 minimum grade B, size, and wall thickness as indicated on The Drawings.

D. Trench Utility Locator Tape: Heavy duty 6" wide underground warning tape. Tape shall be made from polyethylene material, 3.5 mils thick, with a minimum tensile strength of 1,750 psi. Place the tape at one-half the minimum depth of cover for the utility line or a maximum of 3 feet, whichever is the less, but never above the top of subgrade. Color of tape shall be determined by as follows:

Natural Gas or Propane – Yellow.
Electric – Red.
Telephone – Orange.
Water – Blue.
Sanitary Sewer – Green.

2.3 EQUIPMENT

A. Transport off-site materials to project using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.

2.4 SOURCE QUALITY CONTROL

A. Laboratory testing of materials proposed for use in the project shall be by the Contractor.

B. Following tests shall be performed on each type of on-site or imported soil material used as compacted fill:

Moisture and Density Relationship: ASTM D698 or ASTM D1557.
Mechanical Analysis: AASHTO T88 or ASTM D422.
Plasticity Index: ASTM D4318.

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, datum, elevations, and grades necessary for construction as shown on the drawings.

B. Notify utility companies to remove or relocate public utilities that are in conflict with proposed improvements.

C. Protect plant life, lawns, fences, existing structures, sidewalks, paving, and curbs, unless otherwise noted on the drawings from excavating equipment and vehicular traffic.

D. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

E. Remove from site, material encountered in grading operations that is unsatisfactory material or undesirable for backfilling, subgrade, or foundation purposes. Dispose of in manner satisfactory to Owner and local governing agencies. Backfill areas with layers of satisfactory material and compact as specified herein.

F. Prior to placing fill in low areas, such as previously existing creeks, ponds, or lakes, perform following procedures:

Drain water out by gravity with ditch having flow line lower than lowest elevation in low area. If drainage cannot be performed by gravity ditch, use adequate pump to obtain the same results.

After drainage of low area is complete, remove muck, mud, debris, and other unsatisfactory material by using acceptable equipment and methods that will keep natural soils underlying low area dry and undisturbed.

All muck, mud, and other materials removed from low areas shall be dried on-site by spreading in thin layers for observation. Material shall be inspected and, if found to be satisfactory for use as fill material, shall be incorporated into lowest elevation of site filling operation, but not under building subgrade or within 5'-0" of perimeter of building subgrade, paving or outparcel subgrade. If, after observation, material is found to be unsatisfactory, it shall be removed from site.

G. Locate and identify utilities that have previously been installed and protect from damage.

H. Locate and identify existing utilities that are to remain and protect from damage.

I. Maintain in operating condition existing utilities, previously installed utilities, and drainage systems encountered in utility installation. Repair surface or subsurface improvements shown on the Drawings.

J. Verify location, size, elevation, and other pertinent data required making connections to existing utilities and drainage systems as indicated on the Drawings.

K. Over excavate and properly prepare areas of subgrade that are not capable of supporting proposed systems. Stabilize these areas by using acceptable geotextile fabrics or aggregate material placed and compacted as specified in Section 313200.

3.2 DEWATERING

A. General:

Dewatering activities shall conform to applicable provisions in 312500.

Provide dewatering systems as required for utility trenching excavations. This section does not apply to ground water encountered in the mass grading operation from groundwater flowing through buried sand seams.

Design and provide dewatering system using accepted and professional methods consistent with current industry practice to eliminate water entering the excavation under hydrostatic head from the bottom or sides. Design system to prevent differential hydrostatic head, which would result in floating out soil particles in a manner, termed as a “quick” or “boiling” condition. System shall not be dependent solely upon sumps or pumping water from within the excavation where differential head would result in a quick condition, which would continue to worsen the integrity of the excavation’s stability.

Provide dewatering system of sufficient size and capacity to prevent ground and surface water flow into the excavation and to allow Work to be installed in a dry condition.

Control, by acceptable means, all water regardless of source. Contractor shall be responsible for disposal of the water.

Control groundwater in a manner that preserves strength of foundation soils, does not cause instability or raveling of excavation slopes, and does not result in damage to existing structures. Where necessary, lower water level in advance of excavation utilizing wells, wellpoints, jet educators, or similar positive methods. The water level as measured by piezometers shall be maintained a minimum of 3 feet below prevailing excavation level.

Commence dewatering prior to any appearance of water in excavation and continue until Work is complete to the extent that no damage results from hydrostatic pressure, flotation, or other causes.

Open pumping with sumps and ditches will be allowed provided it does not result in boils, loss of fines, softening of the ground, or instability of slopes.

Install wells or wellpoints, if required, with suitable screens and filters so that continuous pumping of fines does not occur. Arrange discharge to facilitate collection of samples by the Owner. During normal pumping and upon development of wells, levels of fine sand or silt in the discharge water shall not exceed 5 ppm. Install sand tester on discharge of each pump during testing to verify that levels are not exceeded.

Control grading around excavations to prevent surface water from flowing into excavation areas.

No additional payment will be made for any supplemental measures to control seepage, groundwater, or artesian head.

B. Design:

Designate and obtain the services of a qualified dewatering specialist to provide dewatering plan as may be necessary to complete the Work.

Contractor shall be responsible for the accuracy of the drawings, design data, and operational records required.

Contractor shall be responsible for the design, installation, operation, maintenance, and any failure of any component of the system.

C. Damages:

Contractor shall be responsible for and shall repair any damage to work in place, other contractor's equipment, utilities, residences, highways, roads, railroads, private and municipal well systems, adjacent structures, natural resources, habitat, existing wells, and the excavation. Contractor responsibility shall also include damage to the bottom due to heave and including but not limited to, removal and pumping out of the excavated area that may result from Contractor's negligence, inadequate or improper design and operation of the dewatering system, and any mechanical or electrical failure of the dewatering system.

Remove subgrade materials rendered unsatisfactory by excessive wetting and replace with approved backfill material at no additional cost to the Owner.

D. Maintaining Excavation in Dewatering Condition:

Dewatering shall be a continuous operation. Interruptions due to power outages or any other reason will not be permitted.

Continuously maintain excavation in a dry condition with positive dewatering methods during preparation of subgrade, installation of pipe, and construction of structures until the critical period of construction or backfill is completed to prevent damage of subgrade support, piping, structure, side slopes, or adjacent facilities from flotation or other hydrostatic pressure imbalance.

Provide standby equipment on site, installed, wired, and available for immediate operation if required to maintain dewatering on a continuous basis in the event any part of the system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, perform such work as

may be required to restore damaged structures and foundation soils at no additional cost to Owner.
System maintenance shall include but not be limited to 24-hour supervision by personnel skilled in the operation, maintenance, and replacement of system components and any other work required to maintain excavation in dewatered condition.

E. System Removal: Upon completion of the work, remove dewatering equipment from the site, including related temporary electrical service.

F. Wells shall be removed or cut off a minimum of 3 feet below final ground surface, capped, and abandoned in accordance with regulations by agencies having jurisdiction.

3.3 TOPSOIL EXCAVATION (Root Mass)

A. Strip organic root mass to a depth of 4” from areas that are to be filled, excavated, landscaped, or re-graded to such depth that it prevents intermingling with underlying subsoil or questionable material.

B. Stockpile topsoil in storage piles in areas as shown on the plans. Construct storage piles to freely drain surface water. Cover storage piles as required to prevent windblown dust. Dispose of unsuitable topsoil as specified for waste material, unless otherwise specified by Owner. Remove excess topsoil from site unless specifically noted otherwise on the Drawings.

3.4 GENERAL EXCAVATION

A. Classification of Excavation: The Contractor shall assure himself by site investigation or other necessary means that he is familiar with the type, quantity, quality, and character of excavation work to be performed. Excavation shall be considered unclassified excavation, except as indicated in the Contract Documents.

B. When performing grading operations during periods of wet weather, provide adequate dewatering, drainage and ground water management to control moisture of soils.

C. Shore, brace, and drain excavations as necessary to maintain excavation as safe, secure, and free of water at all times.

D. Place satisfactory excavated material into project fill areas.

E. Unsatisfactory excavated material shall be disposed of in manner and location that is acceptable to Owner and local governing agencies.

F. Perform excavation using capable, well-maintained equipment and methods acceptable to Owner and local governing agencies.

3.5 TRENCHING EXCAVATION FOR UTILITIES

A. Contact local utility companies before excavation begins. Dig trench at proper width and depth for laying pipe, conduit, or cable. Cut trench banks vertical, if possible, and remove stones from bottom of trench as necessary to avoid point-bearing. Over-excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide suitable base for continuous and uniform bedding. Replace over-excavation with satisfactory material and dispose of unsatisfactory material.

B. Trench excavation sidewalls shall be sloped, shored, sheeted, braced, or otherwise supported by means of sufficient strength to protect workmen in accordance with applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to exit ladder or steps shall not be greater than 25 feet in trenches 4 feet or deeper.

C. Perform trench excavation as indicated on the Drawings for specified depths. During excavation, stockpile materials suitable for backfilling in orderly manner far enough from bank of trench to avoid overloading, slides, or cave-ins.

D. Remove excavated materials not required or not satisfactory as backfill or embankments and waste off-site or at locations shown on the plans in accordance with governing regulations.

E. Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches and other excavations as specified.

F. Open cut excavation with trenching machine or backhoe. Where machines other than ladder or wheel-type trenching machines are used, do not use clods for backfill.

G. Accurately grade trench bottom to provide uniform bearing and support for each section of pipe on bedding material at every point along entire length except where necessary to excavate for bell holes, proper sealing of pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make joint connection properly.

H. Trench width below top of pipe shall not be less than 12 inches nor more than 18 inches wider than outside surface of pipe or conduit that is to be installed to designated elevations and grades. Other trench width for pipe, conduit, or cable shall be least practical width that will allow for proper compaction of trench backfill.

I. Trench depth requirements measured from finished grade or paved surface shall meet the following requirements or applicable codes and ordinances, whichever is more stringent:
   1. Water Mains: 72 inches to top of pipe barrel or 6 inches below frost line, established by local building official, whichever is deeper.

2. Sanitary Sewer: Elevations and grades as indicated on the drawings and as specified in Section 333100.
3. Storm Sewer: Elevations and grades as indicated on the Drawings.
4. Electrical Conduits: 24 inches minimum to top of conduit or as required by NEC 300-5, NEC 710-36 codes, or local utility company requirements, whichever is deeper.
5. TV Conduits: 18 inches minimum to top of conduit or as required by local utility company, whichever is deeper.
6. Telephone Conduits: 18 inches minimum to top of conduit, or as required by local utility company, whichever is deeper.
7. Gas Mains and Service: 30 inches minimum to top of pipe, or as required by local utility company, whichever is deeper.

3.6 SUBGRADE PREPARATION

A. Scarification and Compaction: Areas exposed by excavation or stripping and on which subgrade preparations are to be performed shall be scarified to minimum depth of 8 inches and compacted as specified hereinafter.

B. Proofrolling: Subgrades shall be proofrolled to detect areas of insufficient compaction and soft pocket, or areas of excess yielding. Proofrolling shall be accomplished by making minimum of two complete passes with fully-loaded tandem-axle dump truck with a minimum weight of 20 tons, or approved equal, in each of two perpendicular directions. Limit vehicle speed to three mph. Areas of failure such as soft spots, unsatisfactory soils, and areas of excessive pumping or rutting shall be excavated and re-compacted as specified herein. Continual failure areas shall be stabilized in accordance with Section 313200 Soil Stabilization. Subgrade exposed longer than 48 hours or on which precipitation has occurred shall be re-proofrolled. Document proofrolling procedure, specific locations, deficiencies, and corrective measures for review by Owner or Owner's CTL upon request.

3.7 FILLING

A. Fill areas to contours and elevations shown on the Drawings with materials deemed satisfactory.

B. Place fills in continuous lifts specified herein.

C. Fill within proposed building subgrade, paving subgrade, and outparcel subgrades shall not contain rock or stone greater than 6 inches in any dimension.

D. Unless otherwise specified for rock fill, rock or stone less than 6-inches in largest dimension may be used in fill below structures, paving, outparcels, and graded areas, up to 24 inches below surface of proposed subgrade or finish grade of graded areas when mixed with satisfactory material. Rock or stone less than 2 inches in largest dimension may be used in fill within the upper 24 inches of proposed subgrade or finish grade of graded areas when mixed with satisfactory material.

E. Fill materials used in preparation of subgrade shall be placed in lifts or layers not to exceed 8 inches loose measure and compacted as specified hereinafter.

F. Import fill materials to be engineered fill. Import soils shall be tested and approved by owners CTL at Contractor's cost.

3.8 PIPE BEDDING

A. Excavate trenches for pipe or conduit to 4 inches below bottom of pipe and to the width as specified herein. Place 4 inches of bedding material, compact in bottom of trench, and shape to conform to lower portion of pipe barrel.

B. Place geotextile fabric as specified on the Drawings and in accordance with Section 313200.

3.9 TRENCH BACKFILLING

A. Materials used for trench backfill shall comply with requirements as specified herein.

B. Backfill and compact in accordance with fill and compaction requirements in ASTM D2321 unless otherwise shown on the drawings.

C. Do not backfill trenches until required tests are performed and utility systems comply with and are accepted by applicable governing authorities.

D. Backfill trenches to contours and elevations shown on the Drawings.

E. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

3.10 COMPACTION

A. Compact as follows:

Location	Percent of Maximum Laboratory Density ASTM D698
Subgrade & Fill below synthetic turf	95
Subgrade & Fill for foundations, slabs and pavements	95

B. Maintain moisture content of not less than 2 percent below and not more than 3 percent above standard Proctor optimum moisture content of fill materials to attain required compaction density.

C. Exercise proper caution when compacting immediately over top of pipes or conduits. Water jetting or flooding is not permitted as method of compaction.

D. Corrective Measures for Non-Complying Compaction: Remove and recompact deficient areas until proper compaction is obtained. Continual failure areas shall be stabilized in accordance with Section 313200, AND Geotechnical Report (Appendix A, Terracon Report dated April 4, 2012) at no additional cost to Owner.

3.11 MAINTENANCE OF SUBGRADE

A. Verify finished subgrades to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction, including concrete trucks, dump trucks, and other construction equipment.

C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in manner that will comply with compaction requirements. Imported material shall be tested for suitability by the owner's geotechnical engineer prior to placement in fill areas. Surface of subgrade after compaction shall be firm, uniform, smooth, stable, and true to grade and cross-section.

D. Construct temporary ditches and perform such grading as necessary to maintain positive drainage away from subgrade at all times.

3.12 BORROW AND SPOIL SITES

A. Comply with NPDES and local erosion control permitting requirements for any and all on-site and off-site, disturbed stockpile, spoil and borrow areas. Upon completion of stockpile, spoil or borrow operations, clean up stockpile, spoil or borrow areas in a neat and reasonable manner to the satisfaction of Owner or off-site property owner, if applicable.

3.13 FINISH GRADING

A. Check grading of building subgrades by string line from grade stakes (blue tops) set at not more than 50-foot centers. Allowable tolerance shall be plus or minus 0.10 feet from plan grade. Provide engineering and field staking as necessary for verification of lines, grades, and elevations.

B. Grade areas where finish grade elevations or contours are indicated on the Drawings, other than paved areas, outparcels, and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. Ground surfaces shall vary uniformly between indicated elevations. Grade finished ditches to allow for proper drainage without ponding and in manner that will minimize erosion potential. For topsoil, sodding, and seeding requirements refer to landscaping plans.

C. Correct settled and eroded areas within 1 year after date of completion at no additional expense to Owner. Bring grades to proper elevation.

3.14 FIELD QUALITY CONTROL

A. Field quality control shall be the responsibility of the Contractor. Except for specified mandatory testing, field quality control testing and inspection shall be at the discretion of the Contractor as necessary to assure compliance with Contract requirements. Owner T&I specified below shall not be considered a substitute for the Contractor's

responsibility to perform similar routine, necessary, and customary testing and inspection of the methods and frequency suitable for the type of work involved.

3.15 OWNER TESTING AND INSPECTION (T&I)

A. The Owner will perform testing and inspection (T & I) but only as a means of verification to the Owner of Contractor quality control performance.

B. Testing and inspection shall be either continuous or periodic and as follows:
Continuous: Perform in areas supporting a structure including, but not limited to, building pad area, retaining walls, etc. When continuous testing and inspection is in progress, conduct testing and inspection in areas outside building pad or structure at the frequencies stated herein. This shall include, but not limited to, the CTL requesting and reviewing GC proofrolling documentation to assure correctness and completeness of proofrolling and any associated corrective actions taken by the Contractor.
Periodic: In addition to continuous inspections specified above, perform unannounced periodic testing visits as follows when continuous testing is not being performed as described above:
    a. As requested by the owner during the first week when earthwork starts in a paved area.
    b. As requested by the owner each week thereafter until earthwork is complete.

C. Test Frequency:
Number of tests to be taken at each site visit shall be the test frequencies stated based on quantities or occurrences which have accumulated up to, in between, or during each periodic visit.
Not less than one specified test shall be conducted each periodic visit when material has been placed since last visit.
In addition, at least one specified test shall be conducted on work being placed during each periodic visit.

D. Field testing, frequency, and methods may vary as determined by and between the Owner and the CTL.

E. Work shall be performed by a Special Inspector – Technical I unless specified otherwise. Report of testing and inspection results shall be made upon the completion of testing.

F. Classification of Materials: Perform test for classification of materials used and encountered during construction in accordance with ASTM D2488 and ASTM D2487.

G. Laboratory Testing Of Materials: Perform laboratory testing of materials (Proctor, Sieve Analysis, Atterberg Limits, Consolidation Test, etc.) as specified.

H. Proofrolling: Document and explain proofrolling inspection procedures and results in the laboratory inspection report.

I. Field Density Tests

1. Building Subgrade Areas, including 5'-0" Outside of Exterior Building Lines: In cut areas, not less than one compaction test for every 2,500 sq. ft and at locations along all continuous wall footings with intervals not exceeding 100 feet and at each column spread footing. In fill areas, same rate of testing for each 8-inch lift, measured loose and at locations along continuous wall footings with intervals not exceeding 100 feet and at each column spread footing.
    a. Density tests on top of building subgrade shall be performed within 48 hours prior to placement of overlying materials. If inclement weather occurs after testing, retest prior to placement of overlying materials.
2. Paving Areas and other Areas of Construction Exclusive of Building Subgrade:
    a. In cut areas, not less than one compaction test for every 10,000 sq. ft. In fill areas, same rate of testing for each 8-inch lift, measured loose.
    b. Utility Trench Backfill: Intervals not exceeding 200-feet of trench for first and every other 8-inch lift of compacted trench backfill.
3. Test Method: In-place nuclear density, ASTM D6938.

J. Observation and Inspection:
1. Observe all subgrades/excavation bases below footings and slabs and verify design bearing capacity is achieved as required. Work shall be performed by a Special Inspector – Technical II.
2. Observe and document presence of groundwater within excavations.

3.16 ADDITIONAL CONTRACTOR RESPONSBILITIES

A. The Contractor shall coordinate closely with the Owner's T&I representative to assure proper testing in accordance with the requirements of these documents.

B. The Contractor shall be responsible for all costs to correct areas which do not meet the requirements within these documents. The costs to retest these areas shall be borne by the Contractor

END OF SECTION 312000

SECTION 312500 EROSION AND SEDIMENTATION CONTROL

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Stormwater Pollution Prevention Plan (SWPPP).
   2. Installation of temporary and permanent erosion and sedimentation control systems
   3. Installation of temporary and permanent slope protection systems

B. Related Sections
   1. Applicable Sections of the State of Illinois Department of Transportation “Standard Specifications for Road and Bridge Construction in Illinois”, current edition.
   2. Applicable rules and regulations of the State of Illinois NPDES General Permit.
   3. Illinois Urban Manual, latest Edition
   4. Applicable rules and regulations of the City of Rockford
   5. Storm Water Pollution Prevention Plan for this project
   6. Construction Drawings for this project
   7. Applicable sections of the project specifications

1.2 ENVIRONMENTAL REQUIREMENTS

A. This section shall apply to any construction where 1 or more acres are being disturbed.
B. Contractor shall maintain a copy of the SWPPP plan, permit letter, and NOI in a binder at the construction trailer. Binder shall include sections for inserting record of all weekly inspections which shall be performed by the contractor as well as any periodic inspections generated by a rain event.
C. SWPPP site plan shall be maintained and annotated with the date each and all BMP’s are initiated or installed. Any changes during construction shall be annotated on this copy.
D. Binder shall have a section with a log of all SWPPP BMP maintenance activity.
E. If no construction trailer is located at the site, contractor shall provide a lock box with all SWPPP material. A sign shall identify the lock box to have SWPPP material.
F. Protect adjacent properties, any identified endangered or threatened species and/or critical habitat, any identified cultural or historic resources, and receiving water resources from erosion and sediment damage until final stabilization is achieved. All storm water controls and systems must be installed & functioning as designed and free of accumulated sediment and debris before final project approval.

1.3 DEFINITIONS

A. For purposes of this specification, the following definitions shall apply:
   1. Owner – The Owner refers to Rock Valley College and any employees of said District that have authority to direct the Contractor under terms of the approved contractual agreement for this project.
   2. Contractor – the Contractor refers to the prime General Contractor for the project that has entered into the official contractual agreement with the Rock Valley College. However, for erosion control purposes, contractor may also include sub-contractors or other vendors under the General Contractor control that may be involved in operations impacting the erosion and sediment control of the project.
   3. Architect – refers to the architect of record for this project. In the case of a project without an architect, the terms architect and engineer may be construed as interchangeable.
   4. Engineer – refers to the civil engineer for the project, and any persons under their direct employ or indirect employ if referring to sub-consultants associated with the preparation of construction drawings.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Seed, sod, and ground covers for the establishment of vegetation in accordance with the State of Illinois Standard Specifications referenced above or project specific specifications and notes, or specific mix designs as provided by the Owner.
B. All erosion control products sediment control devices or materials for non-storm water BMPs as specified herein or on the Construction Drawings, or within the SWPPP including any materials allowed under the Illinois Urban Manual.
C. Rolled erosion control products according to Erosion Control Technology Council (ECTC) standard specifications.
D. Temporary mulches such as loose straw, wood cellulose, or agricultural silage.
E. Rip-Rap (stone protection) as specified in the Standard Specifications
F. Temporary and permanent outfall structures as specified on the drawings.
G. Hydro mulches, hydro seeds, and polymers as allowed under the Illinois Urban Manual.

PART 3 – EXECUTION

3.1 PREPARATION

A. Review the drawings and Stormwater Pollution Prevention Plan.
B. Conduct stormwater pre-construction meeting with Rock Valley College project manager and her key staff, Site Contractor, all ground-disturbing Sub-contractors, architect of record, engineer of record or someone from their office familiar with the site and SWPPP, and state or local agency personnel. At this meeting, the contractor and his appropriate subcontractors will be required to review the Rock Valley College's procedural requirements for Erosion and Sediment control practices on-site. This meeting may be combined with a general pre-construction meeting or conducted as an independent meeting.
C. Contractor shall revise proposed SWPPP as necessary to address potential pollution from site identified during the preconstruction meeting. Cost for SWPPP maintenance and updates is incidental.
D. Install SWPPP information sign with all applicable documents.

3.2 EROSION AND SEDIMENTATION CONTROL AND SLOPE PROTECTION IMPLEMENTATION

A. Place erosion and sediment control systems in accordance with the drawings and Stormwater Pollution Prevention Plan, pre-construction meeting, or as may be dictated by site conditions in order to maintain the intent of the specifications and permits.
B. The Stormwater Pollution Prevention Plan and Site Maps shall be corrected or modified as site conditions change. Changes during construction shall be noted in the Stormwater Pollution Prevention Plan and posted on the drawings (Site Maps).
C. Rock Valley College has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations and to direct Contractor to provide immediate permanent or temporary pollution control measures to maintain their good standing with the NPDES permit requirements.
D. Maintain erosion and sedimentation control systems as dictated by site conditions, indicated in the construction documents, or as directed by governing authorities or Owner to control sediment until final stabilization. Contractor shall respond to maintenance or corrective work identified by Owner or governing authorities immediately, but in no case taking longer than 24 hours.
E. Contractor shall incorporate permanent erosion control features, paving, permanent slope stabilization, and vegetation into project at earliest practical time to minimize need for temporary controls.
F. Permanently seed and restore cut and fill slopes as construction proceeds to extent considered desirable and practical.

G. Unless required within a shorter timeframe by the applicable General Permit for Stormwater Discharges Associated with Construction Activity, disturbed areas that will not be graded or actively worked for a period of 14 days or more, shall be temporarily stabilized as work progresses with vegetation or other acceptable means in accordance with NPDES permit requirements unless otherwise specified in the Contract Documents. In the event it is not practical to seed areas, slopes must be stabilized with mulch and tackifier, bonded fiber matrix, netting, blankets or other means to reduce the erosive potential of the area.

PART 4 – COMPLETION

4.1 SITE STABILIZATION AND FINAL PAYMENT

A. Final site stabilization is achieved when perennial vegetative cover provides permanent stabilization with a density greater than **70 percent** over the entire area to be stabilized by vegetative cover. Contractor shall confirm establishment of this requirement prior to scheduling a final stabilization site review with Rock Valley College.
B. Contractor shall arrange for a meeting with Rock Valley College, Engineer, and Architect to review the level of site stabilization. Any deficiencies noted shall be corrected prior to Rock Valley College submitting the Notice of Termination.
C. Rock Valley College shall be responsible for completion and submittal of the NOT form to the IEPA. The submittal of this form will trigger a site inspection visit from the IEPA to verify that the site has successfully met the requirements of the General Permit.
D. The contractor is required to maintain his regular reporting and inspection schedule until the NOT is recognized by the IEPA.
E. Until such time as a written sign-off from the IEPA is received, Rock Valley College may withhold, at a minimum, 3% of the total contract amount for final payment, regardless of the status of any other construction. Therefore, it is in the contractor’s best interest to make sure the site is stabilized in order to avoid the minimum holdback.

PART 5 – DAMAGES

Rock Valley College expects that the contractor will be a good steward of the environment when working on its facilities. It also expects that the contractor is knowledgeable and competent in the implementation and compliance of the NPDES general permit. Rock Valley College will offer assistance to the Contractor as appropriate, but it is the Contractor’s duty and responsibility to make sure the SWPPP is being followed at all times throughout construction of the project. As a public agency, Rock Valley Collete is committed to being an example for good stewardship of the environment, and expects the same of all employees, consultants, and contractors. Lack of attention to these matters will

not be tolerated. Contractor recognizes that its failure to comply with the Storm Water Pollution Prevention Plan may cause the Owner to incur damages in the way of fines and other damages, and that such damages are difficult to ascertain. The following penalties will be implemented throughout the course of construction for contractor negligence in addressing erosion control concerns.

1. **Internal Violations:** Rock Valley Collete, or its consultants, will be making periodic observations of the construction site. Erosion control items found to be in disrepair will be documented. Upon direction from the Owner or Owner's engineer, contractor shall file an Incidence of Non-Compliance Form (ION). A written copy of the ION will be provided to the owner and engineer with a plan for corrective action. Said corrective action will be implemented within 24 hours. For failure to address the non-compliant issue within the specified timeframe, the Contractor shall pay or credit to the Owner, as the case may be, an amount of $1,000.00 per occurrence. This damage shall be in addition to, and not in lieu of, other damages or remedies available to the Owner, including specifically, but not limited to, the Contractor's obligation to correct defective Work.

2. **External Violations:** In the event that a fine or legal action arises from the City of Rockford, Illinois EPA or Illinois Attorney General Office or any other Authority Having Jurisdiction (AHJ) as the result of the Contractor's failure to perform on the SWPPP, Rock Valley College may assign any and all fines, attorney fees, or other consultant fees incurred resulting from defense of legal action by the IEPA or Illinois Attorney General office or any other AHJ to the General Contractor and would, in the case of assignment, deduct those fines and fees from any final payment due the Contractor.

END OF SECTION 312500

SECTION 313200 - SOIL STABILIZATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavation, treatment and backfilling of subgrade for lime stabilization. To be used only upon approval of the owner.
   2. Excavation, treatment and backfilling of subgrade for soil stabilization with soil-cement base course. Soil stabilization with soil-cement base course may be used, only with the approval of the owner or owner's representative, in areas where underground sand seams with flowing groundwater are encountered during construction, to "cap" the sand seam.

B. Related Requirements:
   1. Section 312000 - Grading

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. ASTM International (ASTM):
   1. ASTM C150 - Portland Cement.
   2. ASTM C618 - Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.
   3. ASTM C977 - Quicklime and Hydrated Lime for Soil Stabilization.
   4. ASTM D1633 - Compressive Strength of Molded Soil-Cement Cylinders.

C. American Association of State Highway and Transportation Officials (AASHTO):
   1. AASHTO M216 - Lime for Soil Stabilization.

D. National Lime Association (NLA):
   1. NLA Bulletin 326 - Lime Stabilization Construction Manual.

E. State Department of Transportation (DOT):
   1. Illinois Department of Transportation "Standard Specifications for Road and Bridge Construction in Illinois", current edition, Sections 302 and 1009.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Do not install mixed materials in wind in excess of 10 mph or when temperature is below 40 degrees Fahrenheit.

1.4 SUBMITTALS

A. Submit 30-pound sample of each material to be used at the site in airtight containers to the Construction Testing Laboratory (CTL) or submit gradation and certification of material that is to be used to the CTL for review. Contact the owner or owner's representative for the location of the CTL.

B. Submit name of each materials supplier and specific type and source of each material. Obtain approval of Owner prior to change in source.

C. Submit mix designs, materials mix ratio, and laboratory test data to the Owner's CTL prior to beginning stabilization activities. Certify materials and mix ratios will achieve the specified requirements as indicated in the Construction Documents or as specified by state and local agencies for soil stabilization if not stated in the Construction Documents.

D. Submit approved mix designs, materials mix ratio, and laboratory test data to the engineer prior to commencing stabilization activities.

PART 2 PRODUCTS

1.5 MATERIALS: LIME STABILIZATION

A. Soil Treatment Materials:
   1. Hydrated Lime: ASTM C977 or AASHTO M216.

B. Aggregate:
   1. Coarse Aggregate: Crushed carbonate, crushed gravel, crushed air-cooled slag, granulated slag, a mixture of crushed and granulated slag, or other types of suitable material meeting the following gradation requirements:

Sieve Size	Percent Passing
2 inches	100
1 inch	70-100
3/4 inch	50-90
No. 4	30-60
No. 30	7-30
No. 200	0-5

   2. Fine Aggregate: Sand – Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter meeting the following gradation requirements:

Sieve Size	Percent Passing
No. 4	90-100
No. 50	7-40
No. 200	0-5

C. Subsoil: Existing to be reused.

1.6 ACCESSORIES

A. Curing Seal: Asphalt Emulsion Primer.

1.7 PREPARATION

A. Obtain approval of mix design before proceeding with placement.

B. Start stabilization only when weather and soil conditions are favorable for successful application of proposed material.

C. Proofroll subgrade to identify areas in need of stabilization.

1.8 EQUIPMENT

A. Perform operations using suitable, well maintained equipment capable of excavating subsoil, mixing and placing materials, wetting, consolidating, and compacting of material.

1.9 EXCAVATION

A. Excavate subsoil to depth sufficient to accommodate soil stabilization.

B. Remove lumped subsoil, boulders, and rock that interfere with achieving uniform subsoil conditions.

C. Do not excavate within normal 45 degree bearing splay of any foundation.

D. Notify Owner of unexpected subsurface conditions. Discontinue affected work in area until notified to resume work.

E. Correct areas over-excavated in accordance with Section 312000

F. Remove excess excavated material from site.

1.10 SOIL TREATMENT AND BACKFILLING

A. Lime Stabilized Subgrade: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade with hydrated lime in accordance with state highway department specifications.

B. Backfill and compaction of treated subsoil shall be in accordance with Sections 312000.

C. Maintain optimum moisture of mixed materials to attain required stabilization and compaction.

D. Finish subgrade surface in accordance with Section 312000.

E. Remove surplus mix materials from site.

1.11 CURING

A. Immediately following compaction of mix, seal top surface with curing seal.

B. Do not permit traffic for 72 hours after sealing top surface.

1.12 FIELD QUALITY CONTROL

A. Field quality control shall be the responsibility of the Contractor in accordance with Section 014500. Except for specified mandatory testing, field quality control testing and inspection shall be at the discretion of the Contractor as necessary to assure compliance with Contract requirements. Owner T&I specified below shall not be considered a substitute for the Contractor's responsibility to perform similar routine, necessary, and customary testing and inspection of the methods and frequency suitable for the type of work involved.

1.13 OWNER TESTING AND INSPECTION (T&I)

A. The Owner will perform testing and inspection (T & I) but only as a means of verification to the Owner of Contractor quality control performance.

B. Owner T&I specified herein below will be performed by the Owner's Construction Testing Laboratory (CTL) in accordance with Section 014500

C. Unconfined compression tests on lime, fly ash, or Portland cement treated mixture shall be conducted in accordance with ASTM D1633. Mold three specimens for each mix design submitted by the Contractor to verify mix design meets the specified requirements. Cure each specimen at a constant moisture content and temperature for 28 days. Test for unconfined compressive strength and compare to the specified design strength. Perform test minimum of three weeks prior to proposed stabilization activities.

D. Field Density: Field in-place density shall be determined as specified in Section 312000.

1.14 MATERIALS: SOIL-CEMENT BASE COURSE

A. Soil Treatment Materials:
   1. Portland Cement: ASTM C150. Also refer to Section 1001 and 1009.03 of the "Standard Specifications for Road and Bridge Construction in Illinois".

B. Subsoil: Existing to be reused.

1.15 PREPARATION

A. Obtain approval of mix design before proceeding with placement.

B. Start stabilization only when weather and soil conditions are favorable for successful application of proposed material.

1.16 EQUIPMENT

A. Perform operations using suitable, well maintained equipment capable of excavating subsoil, mixing and placing materials, wetting, consolidating, and compacting of material.

1.17 EXCAVATION

A. Notify Owner of unexpected subsurface conditions. Discontinue affected work in area until notified to resume work.

B. Excavate subsoil to depth sufficient to accommodate soil stabilization.

C. Remove lumped subsoil, boulders, and rock that interfere with achieving uniform subsoil conditions.

D. Correct areas over-excavated in accordance with Section 312000

E. Remove excess excavated material from site.

1.18 SOIL TREATMENT AND BACKFILLING

A. Soil-Cement Stabilized Subgrade: As required, and after receiving written approval from the owner, treat and sand seams with the thickness of soil-cement base course as recommended by the owner's geotechnical engineer in accordance with Sections 302 and 1009 of the referenced "Standard Specifications for Road and Bridge Construction in Illinois". Cost of the geotechnical engineer's services shall be bourne by the contractor.

B. Backfill and compaction of treated subsoil shall be in accordance with Sections 312000.

C. Maintain optimum moisture of mixed materials to attain required stabilization and compaction.

D. Finish subgrade surface in accordance with Section 312000.

E. Remove surplus mix materials from site.

1.19 CURING

A. Do not permit traffic for 72 hours after sealing top surface.

1.20 FIELD QUALITY CONTROL

A. Field quality control shall be the responsibility of the Contractor in accordance with Section 014500. Except for specified mandatory testing, field quality control testing and inspection shall be at the discretion of the Contractor as necessary to assure compliance with Contract requirements. Owner T&I specified below shall not be considered a substitute for the Contractor's responsibility to perform similar routine, necessary, and customary testing and inspection of the methods and frequency suitable for the type of work involved.

1.21 OWNER TESTING AND INSPECTION (T&I)

A. The Owner will perform testing and inspection (T&I) but only as a means of verification to the Owner of Contractor quality control performance.

B. Owner T&I specified herein below will be performed by the Owner's Construction Testing Laboratory (CTL) in accordance with Section 014500

C. Unconfined compression tests on Portland cement treated mixture shall be conducted in accordance with ASTM D1633. Mold three specimens for each mix design submitted by the Contractor to verify mix design meets the specified requirements. Cure each specimen at a constant moisture content and temperature for 28 days. Test for unconfined compressive strength and compare to the specified design strength. Perform test prior to proposed stabilization activities.

D. Field Density: Field in-place density shall be determined as specified in Section 312000.

END OF SECTION 313200

SECTION 313700 – STONE PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Rip-rap, bedding, and filter fabric for stone slope protection.

B. Related Requirements:
   1. Section 312000 – Grading

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rip-Rap: Stone for rip-rap shall consist of field stone or rough unhewn quarry stone as nearly uniform in section as is practical. Stones shall be dense, resistant to action of air and water, and suitable for purpose intended. Unless otherwise specified, stones shall weigh between 40 and 150 pounds each.

B. Bedding Stone: Quarried and crushed angular limestone, 6-inches in depth, and with the following gradation:

Sieve Designation	% By Weight Passing Square Mesh Sieves
3”	100
No. 4	0-16

C. Filter Fabric: Fabric shall be as specified in IDOT Standard Specifications.

PART 3 - EXECUTION

3.1 PREPARATION

A. Start stabilization only when weather and soil conditions are favorable for successful application of proposed material.

B. Notify Construction Manager of unexpected subsurface conditions. Discontinue affected work in area until notified to resume work.

C. Dress slopes and other areas to be protected to line and grade shown on Construction Drawings prior to placing of rip-rap. Undercut areas to receive rip-rap to elevation equal to final elevation less average diameter of stones before placing rip-rap.

D. Correct areas over-excavated in accordance with Section 312000.

E. Remove excess excavated material from site.

3.2 PLACEMENT

A. Place rip-rap in areas where indicated on Construction Drawings.

B. Install filter fabric and bedding stone prior to placement of rip-rap if so indicated on Construction Drawings.

C. Place stones so that greater portion of weight is carried by earth and not by adjacent stones. Place stones in single layer with close joints. Upright areas of stone shall make angle of approximately 90 degrees with embankment slope. Place courses from bottom of embankment upward, with larger stones being placed in lower courses. Fill open joints with spalls. Embed stones in embankment as necessary to present uniform top surface such that variation between tops of adjacent stones shall not exceed 3 inches.

3.3 GEOTEXTILE FABRIC AND/OR GEOGRID

A. Place geotextile fabric over subsoil surface, lap edges and ends in accordance with manufacturer’s recommendations and as shown on the Drawings.

END OF SECTION 313700

SECTION 321200 - PAVING BASE COURSE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. The work performed under this section shall consist of a paving base course as specified, constructed on a prepared subgrade in accordance with these Specifications and in reasonably close conformity with the lines, grades, thickness, and cross-sections shown on the plans or Contract Documents.

B. Any Illinois Department of Transportation specification section referred to or noted on the drawings which pertains to paving base course design, materials, preparation, and/or execution shall supersede this section. All materials shall be as indicated on drawings and shall comply with applicable IDOT specifications regarding source, quality, gradation, liquid limit, plasticity index, and mix proportioning.

1.2 REGULATORY/RELATED REQUIREMENTS

A. Construction Drawings

B. Specs. Section 31 10 00 Site Clearing

C. Specs. Section 31 20 00 Earthwork

D. Illinois Department of Transportation "Standard Specifications for Road and Bridge Construction”, latest edition.

E. Current applicable City, County, Federal, and State Ordinances, latest edition.

F. Coordination with others.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Submit materials certificate to on-site independent testing laboratory. Certificate shall be signed by material producer and Contractor, certifying that materials comply with, or exceed, the requirements herein.

PART 3 – EXECUTION

3.1 BASE CONSTRUCTION

A. Perform base course construction in a manner that will drain surface properly at all times and at same time prevent runoff from adjacent areas from draining onto base course construction.

B. Do not construct paving base course on a wet or frozen subgrade.

C. Compact base materials to not less than 95% of maximum dry density as determined by ASTM D-1557, unless otherwise indicated on the drawings.

D. Granular Base: Construct to thickness indicated on drawings. Apply in lifts or layers not exceeding 8", measured loose.

E. Sand/Shell Base: Construct to thickness indicated on drawings. Apply in lifts or layers not exceeding 4", measured loose.

F. Asphalt Institute Type IV Mix for Full Depth Asphalt Base: Construct to thickness indicated on drawings in maximum lifts or layers of three inches (3") measured loose.

G. Asphalt Institute Type VI, VII, or VIII Mixes for Hot- Mix Sand Asphalt Bases: Construct to thickness indicated on drawings. Apply in lifts or layers not exceeding 3", measured loose.

H. Soil Cement Stabilized Base: Construct to thickness and strength as indicated on drawings and in accordance with applicable state highway specifications. If not indicated on the drawings, the minimum compressive strength shall be 500 psi (measured at 28 days).

3.1 QUALITY ASSURANCE

A. An independent testing laboratory selected and paid by Owner, will be retained to perform construction testing of in-place base courses for compliance with requirements for thickness and tolerance. Paving base course tolerances shall be verified (by rod and level readings on no more than fifty-foot centers) to ±1/2" of design elevation that allow for paving thicknesses as shown on the drawings. Contractor shall provide instruments and a suitable benchmark for and documentation of said verification. Contractor shall provide Architect and Owner with copy of elevation readings taken for verification of paving base course tolerances.

B. The following tests shall be performed on each type of material used as base course material:

1. Moisture and Density Relationship: ASTM D-1557
2. Mechanical Analysis: AASHTO T-88
3. Plasticity Index: ASTM D-4318-84
4. Base Material Thickness: Perform one test for each 20,000 square feet area of in-place base material area.
5. Base Material Compaction: Perform one test in each lift for each 20,000 square feet area of in-place base material.

6. Test each source of base material for compliance with applicable state highway specifications.

C. Field density tests for in-place materials shall be performed according to one of the following standards as part of construction testing requirements:

1. Sand Cone Method: ASTM D 1556
2. Balloon Method: ASTM D 2167
3. Nuclear Method: ASTM D 2922

D. Independent testing laboratory shall prepare test reports that indicate test location, elevation data, and test results. Owner, Engineer/Architect and Contractor shall be provided with copies of reports within 48 hours of time test was performed. In the event that any test performed fails to meet these Specifications, Owner, Engineer/Architect and Contractor shall be notified immediately by independent testing laboratory. Owner reserves the right to employ independent testing laboratory and to direct any testing that is deemed by them to be necessary Contractor shall provide free access to site for testing activities.

END OF SECTION 321200

SECTION 32 1216 - ASPHALT 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. Hot-mix asphalt paving.
   2. Asphalt Sealcoating of existing pavements.

B. Related Requirements:
   1. Division 31 Section "Grading" for subgrade preparation, fill material, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
   2. Asphalt Sealcoat Manufacturer’s Association “Standard Specifications”, current edition.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include technical data and tested physical and performance properties.
   2. HMA Pavements: Job-Mix Designs: Submit mix design for HMA Binder Course, IL 19.0, N50 and HMA Surface Course, Mix “C”, N50
   3. Sealcoating existing pavements: Submit to the owner or owner’s engineer a laboratory report of tests and manufacturer’s certificate of compliance covering the specific materials to be used on the project. The tests shall be performed by a laboratory capable of performing the applicable ASMA recommended tests as set forth in Table 1 of the referenced “Standard Specifications”.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: IDOT Pre-Qualification.

B. Material Test Reports: For each paving material, submit Plant Report of gradation and density by a qualified testing agency.

C. Field HMA QA/QC reports.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: The Contractor shall provide Quality Control in accordance with Section 1030.05 (d) of the Standard Specifications for Road and Bridge Construction.

B. Sealcoating: The Contractor shall provide Quality Control in accordance with the ASMA “Standard Specifications”.

C. Testing Agency Qualifications: Qualified according to IDOT HMA Level 1 with HMA Level 2 supervision for testing indicated.

D. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of applicable sections of Article 406 of the IDOT Standard Specifications for Road and Bridge Construction, for asphalt paving work.

E. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
   1. Prime Coat: Minimum surface temperature of 60 deg F.
   2. Sealcoat: Minimum surface temperature of 60 deg F
   3. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
   4. Asphalt Surface Course: Minimum surface temperature of 45 deg F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in IDOT approved mix designs.

B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
   a. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: in accordance with approved IDOT mix design.

E. Crack Sealer for Sealcoating: In accordance with Section 451 of the State of Illinois “Stadard Specifications for Road and Bridge Construction in Illinois”, current edition.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: HMA IL-19.0, N50 according to IDOT Standard Specifications for Road & Bridge Construction.

B. Asphalt Surface: HMA Mix “C”, N50 according to IDOT Standard Specifications for Road & Bridge Construction.

C. Asphalt Cement: ASTM D 3381 according to according to Section 1032 of the Standard Specifications for Road and Bridge Construction and the approved mix design.

D. Emulsified Asphalt Prime Coat: ASTM D 977

E. Sealcoat for existing pavements: Section 1-3.02 of the ASMA “Standard Specifications”.

F. Water: Potable.

2.3 MIXES

A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes IDOT and complying with the following requirements:
   1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
   2. Base Course: HMA Binder Course IL-19.0, N50
   3. Surface Course: HMA Surface Course Mix “C”, N50

2.4 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Pavement Marking paint shall meet the specifications of Section 1095.02 of the Standard Specifications for Road and Bridge Construction.

B. Glass Beads: Glass beads shall meet the requirements of Section 1095.07 of the Standard Specifications for Road and Bridge Construction for Type B Glass beads.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
   1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
   2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 25 tons.
   3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Owner, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.
   1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
   2. Protect primed substrate from damage until ready to receive paving.
   3. For sealcoating existing pavements: Per Section 1-3.05 of the ASMA “Standard Specifications”.

3.3 PLACING HOT-MIX ASPHALT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
   1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
   2. Place hot-mix asphalt surface course in single lift.
   3. Spread mix at a minimum temperature of 250 deg F.
   4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.

5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
   1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.
   2. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.4 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
   1. Clean contact surfaces and apply tack coat to joints.
   2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
   3. Offset transverse joints, in successive courses, a minimum of 24 inches.
   4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
   5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
   6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.5 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
   1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density.

Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 95 percent of reference laboratory density according to **ASTM D 6927** or **AASHTO T 245**, but not less than 93 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.6 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
   1. Base Course: Plus or minus 1/2 inch.
   2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
   1. Base Course: 1/4 inch
   2. Surface Course: 1/8 inch
   3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.7 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Engineer.

B. Sweep and clean surface to eliminate loose material and dust.

C. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
   1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to the asphalt surface. Mask an extended area beyond

edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.

2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: The Contractor shall provide HMA Quality Control in accordance with Section 1030.05 of the Standard Specifications for Road and Bridge Construction. The owner will engage a qualified testing agency to perform Quality Assurance tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to **ASTM D 979 or AASHTO T 168**.
   1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
   2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
      a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than three cores taken.
      b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

E. Replace core sample holes with non-shrink grout where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION 32 1216

SECTION 328400- PLANTING IRRIGATION

PART 1 – GENERAL

1.0 RELATED DOCUMENTS

1.1 Attention is directed to the Bidding and Contract Requirements and General and Supplemental Requirements, which are hereby made a part of this Section.

1.2 DESCRIPTION OF WORK

A. Field locate and connect to the irrigation water supply as shown on plans.
B. Furnish all labor, materials, supplies, equipment, tools, and transportation, and perform all operations in connection with and reasonably incidental to the complete installation of a complete irrigation system, and guarantee/warranty as shown on the drawings, the installation details, and as specified herein. The system shall be constructed to grades and conform to areas and locations as shown on the drawings. Removal and or restoration of existing improvements, excavation and back-fill, and all other work in accordance with plans and specifications are required. Contractor to acquire all registrations, inspections and permits, controller fees to complete the irrigation system.
C. Extent of irrigation system work is shown on drawings and by provisions of this Section.
D. Sprinkler lines shown on the drawings are essentially diagrammatic. Spacing of the sprinkler heads or quick coupling valves are shown on the drawings and shall be exceeded only with the permission of the Owner's authorized representative.
E. The irrigation system shall include a controlled valve distribution system. CONTRACTOR shall furnish and install equipment as common in the industry, associated piping and incidentals as shown and specified.
F. Items of work specifically included, but not limited to are:
    1.1 Procurement of all applicable licenses, permits, and fees.
    1.2 Coordination of all utilities.
    1.3 Connection of electrical power supply to the irrigation control system.
    1.4 Sleeving for irrigation pipe and wire.
    1.5 As-Built Drawings

1.3 RELATED WORK

A. Division 2-Site Work:
   1. Section 32 92 00 – Lawns and Grasses
   2. Section 31 20 00 – Earthwork

1.4 QUALITY ASSURANCE

A. The "Contractor" shall maintain continuously a competent superintendent, satisfactory to the Owner, with authority to act for him in all matters pertaining to the work. The "Contractor" shall coordinate his work with the other trades.
B. The "Contractor" shall confine his operations to the area to be improved and to the areas allotted him by the Owner's representative for material and equipment storage.
C. The "Contractor" shall have a minimum of 5 years' experience installing irrigation systems of comparable size and complexity. The contractor shall also have suitable financial status to meet obligations for this project.
D. The "Contractor" shall have completed Baseline training prior to the beginning of the irrigation installation. The Contractor shall be a Certified Irrigation Contractor (CIC) certified by the Irrigation Association (IA) and IDPH.

1.5 SUMBITTALS

A. Submit samples under provisions of Section 01 33 00-Submittal Procedures.
B. Materials List: At a minimum include the following, valves, sprinklers, controller, wire, wire connectors, pipe, fittings, valve boxes, swing joints, pipe hangers, electric valves, wire splices, sprinklers, nozzles, fusing devices, grounding components, quick couplers and pump station to be used on the project prior to purchasing materials. Quantities of material need not be included.
C. Manufacturer's Data: Submit manufacturer's catalog cuts, specifications, and operating instructions for the equipment mentioned above and equipment shown on the materials list.
D. Shop Drawings: If there is a change in the design due to an approved product change prior to bidding, submit shop drawings for acceptance, submit written operating and maintenance instructions. Provide format and contents as directed by the Irrigation consultant. Include instruction sheets and parts lists for all operating equipment.
E. Project Record (As-Built) Drawings
   1. The CONTRACTOR is to provide the OWNER a scaled drawing of the completed field "As-Built" of the system.

2. The contractor shall GPS to locate lateral related components of the system versus measuring each lateral component after installation. Pre-staked shots are not allowed as the final location shots.
3. The contractor is to GPS the entire irrigation system including mainlines and all mainline related components, such as quick couplers, electric valves, gate valves, wire splices, lateral lines and heads, etc…GPS data collector shall be survey grade, sub-meter accuracy data collector such as a Trimble or equal.
4. The final as-built shall graphically look like the original bid document. All data collected points are to be on separate layers per symbol. The data point will be on frozen layers under the final graphic symbol. Mainline and lateral lines shall use a continuous shot collection.
5. Components of the system but not limited to, sprinkler heads, electric valves, isolation valves, all PVC piping, quick couplers, PVC pipe sizing, grounding, power wire routes and size and decoder routes from the controller to the electric valves including common runs, sensors, grounding locations, decoder fusing devices and any other installed components. For decoders, all decoder ID's and numbering must be documented and provided to the Owner.
6. Two final hard copies of the overall drawings with dimension and notes are to be provided to the IRRIGATION CONSULTANT/IRRIGATION CONSULTANT and OWNER and one copy of the As-Built created in AutoCAD 2022, not converted to, digital format at the same scale drawing as provided to the Contractor. The contractor is to provide individual controller sequencing sheets in the same format as original drawings and 11" x 17" format. Both submittals shall be laminated and placed as directed by Owner. Contractor may contact the Irrigation consultant/irrigation consultant for these services if needed.
7. The contractor is to provide proof of daily field As-Builts with pay submittal for each area the pay submittal is being submitted for. Payment will not be approved if progress drawings are not submitted. The daily "as-built notes" will be required to be submitted in a three-ring binder at the end of the project.
8. The contractor is to take daily pictures of the work installed for that day prior to any backfilling of the trench and/or in the process of filling the trench. The picture log shall be documented in order of installation and shall be assembled daily and submitted at the end of the project on a zip drive. The contractor is to provide a sample of the daily as-built log and picture log for approval during the first week of installation.
9. Submit the first day's work as-built and picture log for approval to ensure the contractor is documenting the project correctly.
10. The final as-built draft shall be provided prior to punch list items being developed for final acceptance.

1.6 RULES AND REGULATIONS

A. Work and materials shall be in accordance with the latest edition of the National Electric Code, the Uniform Plumbing Code as published by the Western Plumbing Officials Association, and applicable laws and regulations of the federal, state and local governing authorities.

B. When the contract documents call for materials or construction of a better quality or larger size than required by the above-mentioned rules and regulations, provide the quality and size required by the contract documents.

C. If quantities are provided either in these specifications or on the drawings, these quantities are provided for information only. It is the "Contractor's" responsibility to determine the actual quantities of all material, equipment, and supplies required by the project and to complete an independent estimate of quantities and wastage.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver irrigation system components in manufacturer's original undamaged and unopened containers with labels intact and legible.

B. Deliver plastic piping in bundles, packaged to provide adequate protection of pipe ends either threaded or plain.

C. Store and handle materials to prevent damage and deterioration.

D. Provide secure, locked storage for valves, sprinkler heads and similar components that cannot be immediately replaced, to prevent installation delays.

1.8 CODES AND STANDARDS

A. The entire installation shall fully comply with local and state laws and ordinances and with all established codes applicable thereto. Contractor to provide final documents with all licenses and certifications needed for the work in this location.

B. Any permits for the installation or construction of the work included under this contract which are required by any of the legally constituted authorities having jurisdiction, shall be obtained and paid for by the "Contractor", each at the proper time. He shall also arrange for and pay all costs concerning any inspections and examinations required by these authorities.

C. In all cases where inspection of the sprinkler system work is required and/or where portions of the work are specified to be performed under the direction and/inspection of the Owner's authorized representative, the "Contractor" shall notify the Owner's authorized

representative at least 48 hours in advance of the time and such inspection and/or direction is required.

D. Any necessary re-excavation or alterations to the system needed because of failure of the “Contractor” to have the required inspections, in the opinion of the Irrigation consultant, shall be performed at the “Contractor’s” own expense.

E. Contractor to provide to the owner a cop of the IDPH “Contractor test certificate lawn sprinkler system” that was submitted to the state IDPH.

1.9 TESTING

A. Notify the engineer/irrigation consultant/owner’s representative three days in advance of testing.

B. Pipelines jointed with rubber gaskets or threaded connections may be subjected to a pressure test at any time after partial completion of backfill. Pipelines jointed with solvent-welded PVC joints shall be allowed to cure at least 24 hours before testing.

C. Subsections of mainline pipe may be tested independently, subject to the review of the engineer/irrigation consultant/owner’s representative.

D. Furnish clean, clear water, pumps, labor, fittings, and equipment necessary to conduct test or retests.

E. Volumetric Leakage Test:

1. Cap riser of mainline components for volumetric pressure tests. Backfill to prevent pipe from moving under pressure. Expose coupling and fitting.
2. Purge all air from the pipeline before test.
3. Subject mainline pipe to the anticipated operating pressure of the system. Maintain constant pressure. Test complete system under full line pressure. Pressure must be maintained with less than 2lbs loss in the system for 4 hours. If the system does not hold pressure, repair leaks and retest system until the system maintains pressure.
4. All necessary testing equipment shall be furnished by CONTRACTOR.
5. Cement or caulking to seal leaks is prohibited.

F. Operational Test:

1. Activate each remote-control valve in sequence from controller. The engineer/ irrigation consultant/owner’s representative will visually observe operation, water application patterns, and leakage.
2. Replace defective remote-control valve, solenoid, wiring, or appurtenance to correct operational deficiencies.

3. Replace, adjust, or move water emission devices to correct operational or coverage deficiencies.
4. Replace defective pipe, fitting, joint, valve, sprinkler, or appurtenance to correct leakage problems. Cement or caulking to seal leaks is prohibited.
5. Repeat test(s) until each lateral passes all tests. Repeat tests, replace components, and correct deficiencies at no additional cost to the owner.

1.10 CONSTRUCTION REVIEW

A. The purpose of on-site reviews by the engineer/irrigation consultant/owner's representative is to periodically observe the work in progress, the "Contractor's" interpretation of the construction documents, and to address questions with regard to the installation.
B. Scheduled reviews such as those for irrigation system layout or testing must be scheduled with the engineer/irrigation consultant's/owner's representative as required by these specifications.
C. Impromptu reviews may occur at any time during the project.
D. A review may occur at the completion of the irrigation system installation and project record (as-built) drawing submittal.

1.11 GUARANTEE/WARRANTY AND REPLACEMENT

A. It shall be the "Contractor's" responsibility to ensure and guarantee satisfactory operation of the entire system and the workmanship and restoration of the area. The entire system shall be guaranteed to be complete and perfect in every detail for a period of one year from the final acceptance and he hereby agrees to repair or replace any such defects occurring within that year, free of expense to the Owner.
B. Minor maintenance and adjustment shall be by the Owner.
C. For a period of one year from commencement of the final acceptance, fill and repair depressions or settling more than one inch (1"). Restore landscape or structural features damaged by the settlement of irrigation trenches or excavation. Repair damage to the premises caused by a defective item.
D. Make repairs within seven (7) days of notification from the engineer/irrigation consultant/owner's representative.
E. Contract documents govern replacements identically as with new work. Make replacements at no additional cost to the contract price.
F. Guarantee/warranty applies to originally installed materials, equipment, and replacements made during the guarantee/warranty period.

1.12 START-UP AND SEASONAL MAINTENANCE

A. Coordinate the start-up with the Owner's landscape maintenance personnel.
B. "Contractor" shall provide seasonal maintenance of the system the first year as part of this contract and will provide written instructions to the Owner for future service and maintenance.
C. Return to the site during the subsequent spring season and demonstrate to the Owner the proper procedures for the system start-up, operation and proper maintenance. Repair any damage caused within the warranty period, adjust pressures, and adjust nozzles at no additional cost to the owner.
D. After completion, testing and acceptance of the system, the "Contractor" will instruct the Owner's personnel in the operation and maintenance of the system.
E. The contractor will provide the air compressor at the time of blow-out. Notify owner of the blow-out schedule and the contractor shall instruct the owner how to blow out the system. Written instructions are required as well to be include in the final documents.

PART 2 – MATERIALS

2.0 GENERAL

Use materials that are new and without flaws or defects of any type, and which are the best of their class and kind. All material overages at the completion of the installation are the property of the "Contractor" and are to be removed from the site.

A. Each major component of equipment shall have manufacturer's name, address, catalog and serial number permanently attached in a conspicuous place.
B. The same brand or manufacturer shall be used for each specific application of valves, fittings, controls, and other equipment.
C. All materials shall be new and of the quality specified.
D. All equipment shall be listed, approved or rated by a nationally recognized testing and rating bureau of recognized manufacturer's association responsible for setting industry standards. All electrical equipment and apparatus shall be U.L. listed.
    1. Acceptable irrigation manufacturers – As indicated on the drawings or approved equal.

2.1 SUBSTITUTIONS

A. Equipment Substitutions

1. Whenever a piece of equipment or material is identified by a manufacturer's trade name, catalog number, etc., it is intended merely to establish a standard; and any equipment of another manufacturer which will perform adequately the requirements of design and is of equal or greater quality than the specifications in the opinion of the IRRIGATION CONSULTANT will be considered equally acceptable.
2. The specifications shall permit use of materials of any nationally recognized manufacturer so long as they are fully equal to quality and performance of named item in opinion of IRRIGATION CONSULTANT. Materials or equipment of other manufacturers may be used upon the following conditions.
   a. Proposed substitute is equal in design, materials, construction and performance in opinion of IRRIGATION CONSULTANT. No compromise in quality level will be allowed.
   b. Service capabilities, availability of service parts, and stability of manufacturer are adequate in opinion of the IRRIGATION CONSULTANT.
   c. CONTRACTOR assumes responsibility for any modifications required for installation of substitute equipment and for accommodation of such substitution by work of other contractors. Any additional expense on part of other contractors or OWNER due to substitution of equipment shall be borne by CONTRACTOR making such substitution.
   d. Substitute equipment shall fit into space provided with adequate provisions for service and maintenance.
   e. Substitutions must be approved in writing prior to bidding. Substitutions after bidding will not be allowed.

   The Contractor shall use materials as specified. Material other than specified will be permitted only after written application by the "Contractor" and written approval by the Irrigation consultant. Substitutions will only be allowed when in the best interest of the Owner. Substitutions shall be approved equal prior to bidding.

2.2 SLEEVING

A. Install separate sleeve beneath paved areas to route each run of irrigation pipe or wiring bundle.
   1. Sleeving material beneath pedestrian pavements shall be SDR21 PVC Class 200 pipe with solvent welded joints.

2. Sleeving beneath drives and streets shall be SDR21 PVC Class 200 pipe with solvent welded joints.
3. Sleeving diameter: equal to twice that of the pipe or an indicated-on drawings. Minimum wire sleeve to be 2” unless indicated.
4. Sleeve pipe and wire separately.
5. All piping in sleeves are to be glued, no gasketed pipe will be allowed in the sleeve.
6. Contractor to coordinate sleeving with other trades for the landscaping, building penetrations and interior irrigation piping runs.

2.3 PIPE AND FITTINGS

A. Mainline Pipe, Lateral piping and Fittings

1. Use rigid, unplasticized polyvinyl chloride (PVC) 1120, 1220 National Sanitation Foundation (NSF) approved pipe, extruded from material meeting the requirements of Cell Classification 12454-A or 12454-B, ASTM Standard D1784, with an integral belled end.
2. Use Class 200, SDR-21, rated at 200 PSI, conforming to the dimensions and tolerances established by ASTM Standard D2241. Use PVC pipe rated at higher pressures than Class 200 in the case of small nominal diameters that are not manufactured in Class 200.
3. Use rubber-gasketed pipe equipped with Reiber Gasket System for mainline pipe with a nominal diameter 3-inches and greater. Contractor may also use gasketed pipe on 2.5” if desired. Use rubber-gasketed deep bell ductile iron fitting conforming to ASTM A-536 and ASTM F-477 by LEEMCO or approved equal for all fittings 4” and larger. Use lubricant approved by the pipe manufacturer. Size slip fitting socket taper to permit a dry unsoftened pipe end to be inserted no more than halfway into the socket. Saddle and cross fittings are not permitted. Mainline pipe going through sleeves shall be solvent weld. No gasketed pipe is allowed in sleeves.
4. Use solvent weld pipe for mainline pipe with a nominal diameter 1.5”, 2” 2.5” and less or where a pipe connection occurs in a sleeve. Use Schedule 40, Type 1, PVC solvent weld fittings conforming to ASTM Standard D2466 and D1784. Use primer approved by the pipe manufacturer. Solvent cement to conform to ASTM Standard D2564. S-40 fitting may be used on 3” diameter and less.
5. Provide pipe homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, wrinkles and dents.

6. Provide pipe continuously and permanently marked with manufacturer's name and trademark, size schedule and type of pipe working pressure at 73 degrees F. and (NSF) approval.
7. Pipe sizes referenced in the construction documents are minimum sizes and may be increased at the option of the "Contractor" at no cost to the Owner.
8. All pipes damaged or rejected because of defects shall be removed from the site at the time of said rejection.
9. All mainlines and sleeves are to have a metallic tracer tape placed 6" from the surface. The tape shall be 3" wide and indicate "Buried water below". Sleeves shall have tape brought just below the surface at the ends for ease of locating or terminated in valve boxes. Loop tape into and out of all valve boxes.
10. All lateral piping shall be glued.
11. Contractor to run a #14 ga direct bury UL listed wire in the mainline and loop to gate valve, quick couplers or other main line components. Label all wire loops in valve boxes. Use purple jacketed wire for mainline runs. Tape the tracer wire to the pipe every 15 feet.

B. Specialized Pipe and Fittings:
1. Assemblies calling for threaded pipe connections shall use PVC Schedule 80 nipples and PVC Schedule 40 threaded fittings.
2. Joint sealant: Use only Teflon-type tape on plastic threads.
3. Ductile iron fittings: Joint Restraints – all isolation valves shall have a joint restraint system by LEEMCO or approved equal. All ductile iron fittings shall be slanted, deep bell, gasketed style made in accordance with ASTM-A-536, Grade 65-45-12. Fittings shall have four lugs to accommodate joint restraints and other fittings. Bell sections shall allow 5-degree freedom of pipe deflection within the bell end. Gasket design shall be rib-enforced "U-Cup" configuration to seal and assist in restraining pipe at all pressures. Fittings shall be manufactured by LEEMCO or approved equal.
3. Use joint restraints on casketed tees and 90 ells gasketed joints by LEEMCO or approved equal in addition to concrete thrust blocks.
4. Contractor may substitute joint restraints in place of thrust blocks. If joint restraints were to be used, a joint restraint plan must be submitted for approval prior to construction.

C. Thrust Blocks:
1. Use thrust blocks for fitting on pipe utilizing a rubber gasket pipe.

2. Use 3,000 –PSI concrete.
3. Use 2-mil plastic to encapsulate the fitting or valve.
4. Follow pipe manufacturers' requirements for thrust blocking.

2.4 CONTROL SYSTEM COMPONENTS:

A. Controller- Baseline BL-3200X 2-wire decoder controller

1. Baseline 3200 series controller with a large metal wall mount cabinet. The controller shall be mounted inside the pump room.
2. Controller shall operate 2 wire decoders.
3. Controller is to be installed and grounded per manufacturer recommendations.
4. Power to the controllers will be provided by the Owner to the locations. The contractor will be responsible for making the connection from the power drop to the controller. The existing controller has 120v power to be re-used. Provide and install a Paige Electric 250090LED lightning surge arrestor on the 120v power to the controller.
5. Product manufacturer and local distributor are to provide base training for the operation of the controllers at no cost to the owner. The distributor is to have complete knowledge of the operation and programming background of the Baseline system. The contractor will work with the irrigation contractor to set up the programming completely; distributor and contractor train the end user on the operation of the system. Supplying Distributor to have one dedicated person that is trained and completely familiar with the Baseline system, programming and operations.
6. Contractor to fill out the 10-year warranty application and provide approved copies to the owner for all Baseline products prior to final acceptance.
7. Controllers to be wired to the ethernet provided in the
8. Use Baseline BiCoder #BL-5201 single station biCoder as required.
   Central Web Based Package
9. Provide and install Base Manager Web web-based central control, one per controller. BL-BMW5 for five years.
10. Provide and install Mobile access per controller for 5 years, BL-BMW2-MAA-5.
11. Contractor to coordinate with owner for mobile devices needed, computer hardware required to operate the system from a computer.
12. The contractor is to also set up the Baseline controls on any Web based smart phone, iPad and computer that the owner will operate this system from. The controller will operate through the mobile card from the controller to the IPad.

13. The contractor is to provide training of the system to the owner. Contractor/ Distributor to work with the irrigation consultant in setting up the programming and adjusting of the system.
14. The contractor is to complete a learn flow of all zones. They are to set up a base program to run off of time for each zone and label each program and zones with a description. Consult irrigation consultant as to what verbiage needs to be included in the descriptions.
15. The Contractor will be required to have their own internet-accessible tablet onsite for system controls during testing and operation.
16. The Irrigation Consultant will have full, remote, administrative access to BaseManager at all times.

B. Control Wire:

2 wire path

1. 2-wire decoder wire shall be Maxi wire #14 ga by Paige wire or equal. Follow maxi wire color coding.
2. Color: Wire color shall be continuous over its entire length. See drawing for color coding of control wire.
3. Splices: Use 3M DBR/Y-6 wire connector with waterproof sealant. Wire connector to be of plastic construction.
4. Wire markers: pre-numbered or labeled with indelible non-fading ink, made of permanent, non-fading material.
5. All wiring to be installed following existing local and state codes.
6. Provide 5’ of extra wire in the valve boxes so the decoder can be easily removed from the valve box and worked on.
7. Use 2wire Decoder Cable Fusing (DCFD) two-way and three-way as indicated on the plan. Fusing devices to be by Paige Electric.

C. Instrumentation:

1. As presented in the drawing and installation details.
2. Rain Bucket - Install a Baseline Rain Bucket with bird Guard. Baseline BL-5407-KIT-PRO. Tie into the 2wire path and program.
3. Sensor shall be mounted in a location that will be vandal resistant and is able to gather all the necessary data without interference. Coordinate proposed mounting location with the Owner and receive final approval from the owner / Irrigation Consultant.
4. The rain sensor shall be mounted in a location that will be vandal resistant and is able to gather all of the necessary data

without interference. Mount on edge of mechanical building roofline.

5. Surge suppression devices at a minimum shall be installed at all grounding locations indicated on the drawings and installed per detail and manufactures recommendations. Use BL-LA01 devices.
6. There will be one coaches button at the baseball and softball fields to operate the high-speed zones. It will be located at the Coordinate location with the consultant prior to mounting. The buttons will be mounted inside of a Baseline “C” Cabinet Baseline #BL-5401CB2-C. Unless directed otherwise, the cabinets will be mounted at the dugouts. The buttons “on and off” in each cabinet, will need to be tied into the 2-wire path. Run conduit from the ground up to the cabinet. The button will be tied into the zones that run the high-speed heads on the infield. They will run the program and then shut down. Verify programming and operation.
7. The contractor will need to provide and install a Baseline BL-5406_KIT Pressure Sensor biCoder at the pump station to share the existing pressure sensor readings between the pump station and irrigation controller.

D. Power Wire:

1. Electric wire from the power source to control unit shall be solid or stranded copper. Type UF single-conductor cable, UL approved for direct underground burial. Power wires shall be black, white and green in color.
2. Splices: Use approved connectors.
3. Conduit: PVC Schedule 40.
4. Follow all local and state codes.

E. Master Valve / Flow Meter

1. The flow meter and normally open master valve are part of the pump station and will need to be tied into the controls via the 2wire path. The Bicoders are included in the pump station.

F. Decoder Cable Fusing Device (DCFD \ Test Switch)

1. Install inline, two-way, and three-way fusing devices as indicated on the drawings. Devices shall be manufactured by Paige Wire, model number 270DCFD or approved equal.
2. Each DCFD shall have a wire marking tag, Paige Wire model number 270WMT, installed at each location to indicate where each leg of the device leads to and original system volts and amps for each leg of the system to allow for easier future

maintenance.

3. Connect the DCFD leads as per the installation instructions and this specification.
4. Refer to Paige Wire installation instructions for additional information

G. Electric Control Valves

1. All valves shall be of globe configuration with a female pipe thread inlet and outlet connections. Diaphragm assembly shall be sonically welded to form a solid-piece component. The diaphragm shall be of rubber construction to retain flexibility and provide maximum sealing throughout its area.
2. Electric valves shall be Hunter PGV series electric valves or approved equal. The valve shall have a manual flow control with a hand-operated, rising-type flow control stem with control wheel/handle and an internal manual bleed assembly. Size per plan.
3. All parts shall be serviceable without removing valve from line. Valve may be installed at any angle without affecting valve operation.
4. 22" solenoid lead wires shall be attached to a 24 VAC solenoid with waterproof molded coil capable of being removed by turning coil. Valve shall be held normally closed by internal water pressure with manual bleed screw.
5. The legend and flow arrow shall be applied at all valve locations. Valve numbering shall be located so as to be conspicuous and legible. The controller and valve numbering can be engraved in black on a yellow plastic tag, by Christy's Enterprise or equal. The tag size shall be standard size of 2.25" x 2.66**".** An additional ID tag is to be attached by plastic zip tie to the electric valve. The ID tag shall be purple, suffix #009 and read "warning recycled water do not drink /viso agua impure no tomar" on one side and the other side shall be a do not drink symbol. The ID tag shall be the Maxi size, 2.93" x 3.81" and be by Christy's Enterprise or equal. Attach tags with plastic zip ties.

H. Valve Boxes

1. Valve boxes shall be manufactured by Rain Bird VB series or approved equal and shall be rectangular, 12" /w 6" extension or 6" and 10" round and have locking "T" lid tops. Valve box lids in turf areas to be green; valve box lids in plantings to be brown or black.
2. Valve box shall be of a size that provides adequate space for valve repairs. For decoder systems and valve boxes with the

decoder, two valves per 12" rectangular box, other wise 1 electric valve per smaller valve box. A 10" round valve box may be used for isolation valves, quick couplers and wire drops only. For all decoder valves with the decoder, leave 5' of excess wire coiled to allow the removal of the decoder. 7" round valve boxes are to be used on the green roof as detailed.

3. The valve box cover shall have the component markings heat stamped into the cover with minimum 1.5" high, maximum 2" high lettering. Use the following symbols for corresponding components in the valve box.
   GV – for Gate Valves
   EV – for Electric Valves
   WS – for Wire Splice
   QC – for Quick Coupler
   GR- for Grounding
   Other- Label as needed
   The final valve numbering shall also be branded into the tops with electric valves. Contractor may find an example of the branding tool at Brand New Industries Inc., Product # VB2x3.
4. Contractor to coordinate location of valve boxes that are ganged together in clusters of three or more in planting beds with the Irrigation consultant. Receive his approval of locations prior to installation.

I. Quick Coupler Valves
   1. Valves shall be manufactured by Leemco Piping, one-inch in size, model number "L2QCV-FPT-P" or approved equal. The quick coupler valve shall have a purple locking cover.
   2. Match key and hose swivel shall be by Leemco Piping, model number L2QCV-KEY and L2QCV-SWIVEL-010.
   3. Quick Coupler Valves shall be mounted onto a swing joint manufactured by Lasco Fittings. The swing joint shall have brass male threads and be placed in a ten-inch round valve box. The valve box is to be filled with 3/8" clear chip rock as detailed. Ensure proper height when backfilling.
   4. Refer to this specification for additional requirements for the quick coupler swing joint.

J. Swing Joints
   1. Swing Joints riser assemblies shall have a working pressure rating of 315 psi @73F. The swing joint shall have two O-rings at each swivel joint. The inlet and outlet sockets and threads conforming to ASTM standards D 2467 and D 2464,

respectively. The body wall thickness of all components conforming to ASTM D 2464 by Lasco. Spears is not allowed.

2. The swing joint riser assemblies will be molded of Rigid Poly (vinyl) Chloride (PVC) Type 1, Cell Classification 12454-B per ASTM Standard D 1784. It shall be manufactured in such a way, that both the male and female O-ring sealing areas be free from mold parting lines. The burst pressure tested per ASTM D2467 and the long-term pressure tested at 1,000psi for 1,000 hours.
3. The swing joint shall have a three-year warranty for the swing joint riser. The sprinkler swing joint shall have a minimum length 10" riser and quick coupler swing joints shall have a minimum length 10" riser for I-40 and 12" riser for quick couplers and be by Lasco or approved equal. The threads shall correlate to sprinklers, quick couplers and related components. Quick Coupler Swing Joints are to have a brass male threaded outlet 90 ell outlet to enter the bottom of the quick coupler.
4. Contractor is responsible for final lay length of the riser to ensure a 45-degree lay angle.
5. The swing joint shall have the Snap Loc fitting installed with a 24" length of 1" PVC pipe, 12" on each side of the quick coupler. Cut valve box as needed to extend the PVC pipe.

K. Sprinkler Heads – Gear Drives 6" Hunter I-40-06-SS-OP, Hunter I-40-06-SS and Hunter I-40-06-SS-HS Part circle heads.
   1. The large diameter gear drive sprinklers shall be a Hunter I-40 stainless steel w/check Series pop up sprinkler or approved equal. Sprinkler shall be mounted flush with final grade.
   2. Retraction shall be achieved by a heavy-duty steel retraction spring. Sprinkler housing shall be of high impact molded plastic. Sprinkler shall have a large strainer so as to prevent nozzle clogging. Sprinkler shall be constructed such that it is serviceable from top in that drive assembly, screen, and all internal components are accessible throughout top of sprinkler without disturbing case installation. The drive shall be water lubricated and have a drain check valve for up to 7 feet. Radius reductions shall be adjustable by up to 25% by means of adjustment screws accessible from top of cap when sprinkler is properly installed.
   3. Type and location of heads shall be as shown on plan. Sprinkler heads shall be mounted on a double swing S-80 PVC swing joint by Lasco or approved equal. Riser length of pipe to be minimum 10". Contractor is responsible to verify lay length and provide the correct riser length for the pipe depth.
   4. Coordinate head set height with grounds/irrigation consultant.

5. The High-Speed heads shall be Hunter I-40-06-SS HS part circle heads. Place heads 12-18" in turf.

L. Sprinkler Heads – Gear Drives 6" Hunter I-20-PRB circle heads with check valve.
   1. The gear drive sprinklers shall be a Hunter I-20 PRB with pressure regulation and shut off series pop up sprinkler or approved equal. Sprinkler shall be mounted flush with final grade.
   2. Retraction shall be achieved by a heavy-duty steel retraction spring. Sprinkler housing shall be of high impact molded plastic. Sprinkler shall have a large strainer so as to prevent nozzle clogging. Sprinkler shall be constructed such that it is serviceable from top in that drive assembly, screen, and all internal components are accessible throughout top of sprinkler without disturbing case installation. The drive shall be water lubricated and have a drain check valve for up to 5 feet. Radius reductions shall be adjustable by up to 25% by means of adjustment screws accessible from top of cap when sprinkler is properly installed.
   3. Type and location of heads shall be as shown on plan. Sprinkler heads shall be mounted on a ¾" swing S-80 PVC swing joint by Lasco or approved equal. Contractor is responsible to verify lay length and provide the correct riser length for the pipe depth.
   5. Coordinate head set height with grounds/irrigation consultant.

M. Sprinkler Heads – Stream Rotors
   1. The MP rotator sprinklers shall be a 6" Hunter PROS-PRS40-CV with rubber top or approved equal, w/ check Series pop up sprinkler or approved equal. Sprinkler shall be mounted flush with final grade.
   2. Retraction shall be achieved by a heavy-duty stainless steel retraction spring. Sprinkler shall have a riser seal and a wiper. Sprinkler housing shall be of high impact molded plastic. Sprinkler shall have a large strainer so as to prevent nozzle clogging. Sprinkler shall be constructed such that it is serviceable from top in that drive assembly, screen, and all internal components are accessible throughout top of sprinkler without disturbing case installation. The sprinkler shall have a built-in pressure regulation devise to regulate nozzle pressure regardless of the inlet pressure. The sprinkler shall have a drain check valve for up to 10 feet of elevation change.

3. Sprinkler heads shall be mounted on ¾" swing joint connection. S-80 insert tees are to be used on all lateral fittings connecting the head to the pipe. Saddles will not be allowed.

N. Sprinkler Head – Spray Head

1. The spray head sprinkler shall be manufactured by Hunter Industries, PROS Series, six inch and twelve-inch riser with check valve and preset pressure regulation of 30-psi (model number PROS-PRS30-CV) or approved equal.
2. Retraction shall be achieved by a heavy-duty stainless-steel retraction spring.
3. Sprinkler shall have a riser seal and wiper.
4. Sprinkler body shall be of high impact molded plastic.
5. Sprinkler shall have a large strainer to prevent nozzle clogging.
6. Sprinkler shall be constructed such that it is serviceable from the top in that drive assembly screen, and all internal components are accessible throughout the top of sprinkler without disturbing case installation.
7. The sprinkler head shall have a drain check valve for up to ten-feet of elevation change.
8. Type and location of nozzles shall be Rain Bird U-Series set arcs, Rain Bird HE-VAN, Hunter short radius nozzles, nozzle patterns vary, see plan for dimensions.
9. Spray head sprinkler heads shall be mounted on a swing / funny / flex pipe flexible connection with spiral barb elbows. Maximum swing pipe length to be 18-inches. Contractor may use Hunter Industries pre-manufactured swing joints, model number SJ-512 or approved equal, in place of the swing pipe and barb fitting.
10. Sprinkler head shall be mounted flush with the final finish grade.

O. Solvent Weld Fittings

1. Solvent weld PVC fittings shall be Schedule 40, ASTM D-2466 and ASTM D-1784. PVC Schedule-40 fittings shall be produced from PVC Type 1, Cell Classification 1245B. Fittings shall be manufactured by Lasco or approved equal. Spears fittings not allowed. All solvents and cements shall be that recommended by the manufacturer.
2. S-80 PVC fittings may be used and may be threaded or solvent weld.

S-80 TOE Nipples with S-80 couplings for plastic to metal connections.
(S-80 nipples cut in half will not be allowed)

P. Gate/Isolation Valves

1. Isolation valves 2", 2.5" and 3" shall be ductile iron resilient seated globe valves. Valve body and restraint clamps shall be constructed of ductile iron per ASTM A-536, Grade 65-42-12. Epoxy coating on all interior and exterior surfaces shall be fusion bonded epoxy, 10-12 mil thickness. Valve mechanism and hardware shall be made of 100% 304-series stainless steel. The valve stem shall be fine threaded stainless steel, O-ring sealed for ease of operation. Valve outlet shall be deep bell gasket and equipped with integrally cast joint restraint clamps to securely fasten pipe to the valve. Restraint shall have blunt cast serrations. Valve shall be made by LEEMCO or approved equal.
2. Isolation valves 4" and larger, shall meet all AWWA C153 standards. Material shall be ductile iron per ASTM A-536, Grade 65-45-12. Epoxy coating on all interior and exterior surfaces shall be fusion bonded epoxy, 12-14 mil thickness. Valves shall be resilient seat body and bonnet are to be ductile Iron ASTM A536. Stems to be stainless steel with a cast iron 2" square operating nut. The valve shall provide full diameter waterway, low torque operation and absolute shut-off. Valves shall be push-on type valves. Valves to be by LEEMCO Self Restrained Resilient wedge gate valves LMV series. Corresponding joint LEEMCO restraints shall be used with the valve. All by LEEMCO or approved equal.

Q. Tracer Wire

1. Contractor shall use 14-AWG, direct bury, UL listed wire, as manufactured by Paige Wire or approved equal.
2. All tracer wire shall include a solid copper conductor and a polyethylene (PE) insulation.
3. Wire shall be rated for 600-volts.
4. Mainline – Tracer Wire jacket shall be purple in color for all mainline runs.
5. Loop mainline tracer wire up into each valve box and attached an identification tag at each loop location.
6. Wire shall be continuous, and any splices shall only be made in valve boxes and identified on the final record (as-built) drawing.
7. Tape the tracer wire to the pipe at 15-foot intervals.
8. Wire shall be continuous, and any splices shall only be made in

valve boxes and identified on the final record (as-built) drawing.

9. Tape the tracer wire to the pipe at 15-foot intervals.

R. Grounding

1. All decoders are to be grounded as indicated on the drawings. Minimum grounding per detail and per the ASIC detail for controller grounding. Grounding to be a plate and rod arrangement for the controller.
2. Grounding rods shall be 5/8" diameter ground rods with welded insulated conductor x8' long by Paige Electric. No clamps or CaldWeld connectors allowed.
3. Grounding plates shall be 4" x 36" with 10 gauge solid copper wire by Paige Electric.
4. Provide and install Surge suppression devices BL-LA01 at each grounding point. At a minimum, grounding shall be installed at location indicated on the drawings and installed per detail. Use devices in conjunction with 8' grounding rod as show in details at each grounding location and as per manufacturer's recommendation. Ground must be in its own valve box out from the main and not with an electric valve.
5. The contractor will be responsible to provide earth grounding of 2 –wire ohm reading of not more than 10 ohms. The contractor is to provide the Paige Electric equipment part # 182000IC6 for the ground rod with welded wire. Part # 182201IC for the grounding plate assemble and part # 1820058 for the PowerSet earth contact material. PowerSet to be 50lbs on top of plate and 50lbs on bottom of plate. This equipment shall be installed by the contractor per the Paige Electric instructions.
6. The supplying distributor to check all ohm readings with a megger and provide a document signed by the distributor that all readings are under 10ohms. Contractor is responsible for making adjustments to achieve this reading.
7. All grounding wires are to use a re-enterable terminal strip by Paige wire or equal for all ground wire connection points. Wire nuts or shrink wrap are not allowed.

S. Thrust Blocks

1. Thrust blocks will be installed at all gasketed tees, bends, reducer fittings and ends of pipe lines. Thrust blocks will be poured in forming material, placed between undisturbed soil and the fitting to be thrust blocked. Preformed Concrete blocks will not be allowed. Concrete materials will be the Contractor's responsibility to provide. Thurst block sizes are to be per pipe manufacture's thrust blocking guide.

2.5 OTHER COMPONENTS

A. Tools and Extra Equipment

1. The contractor is to provide to the Owner (2) sets of tools to repair and work on all equipment specified in this irrigation section.
2. The contractor is to provide the Owner with (2) I-40 series sprinkler, I-40 high speed heads part and full heads and nozzles of each type specified and used, (2) electric valves of each size used and (3) decoders as used on the project.
3. The contractor shall provide to the Owner, two (2) keys and two (2) hose swivel matching the quick coupling valve installed.
4. Two (2) 5’ valve wrenches for gate valves are to be provided.
5. Provide 5 valve box covers of each valve box used within the project.
6. Provide 2 complete swing joints used for quick couplers and 5 complete swing joints used for sprinkler heads.
7. Provide 20 3M-DB-6 series wire connectors
8. Provide 1 internal valve assembly for each size of the LGV series globe valves and lateral valve connection,

PART 3 – EXECUTION

3.0 INSPECTION AND REVIEWS

A. Site Inspections:

1. The bidder acknowledges that he has examined the site, plans and specifications, and the submission of a proposal shall be considered evidence that examination has been made.
2. Verify construction site conditions and note irregularities affecting work of this section. It shall be the contracting installer’s responsibility to report to the Owner’s authorized representative any deviations between drawings, specifications and the site. Failure to do so before the installing of equipment and resulting in replacing and/or relocation of equipment shall be done at the “Contractor’s” expense.
   a. Examine final grades and installation conditions. Do not start irrigation system work until unsatisfactory conditions are corrected.
   b. Beginning work of this section implies acceptance of existing conditions.

B. Utility Locations:

1. The exact location of all existing utilities and structures and underground utilities are not indicated on the drawings; their locations shall be determined by the “Contractor”, and he shall conduct his work so as to prevent interruption of service or damage to them.
2. Arrange for and coordinate with local authorities the location of all underground utilities.
3. Repair any underground utilities damaged during construction. Make repairs at no additional cost above the contract price.
4. The “Contractor” shall protect existing structures and utility services and be responsible for their replacement if damaged by him.

C. Irrigation System Layout Review:
   1. Irrigation system layout review will occur after the staking has been completed unless specifically waived by the Irrigation consultant. Notify the engineer/irrigation consultant one week in advance of review.
   2. The engineer/irrigation consultant at this review will identify modifications.

3.2 LAYOUT OF WORK

A. Stake out the irrigation system. Items staked include: sprinklers, pipe, control valves, manual drains, quick coupling valves, controller, isolation valves and any misc. components.

B. Install all mainline pipe and mainline components inside of project property lines.

C. Minor adjustments in system layout will be permitted to clear existing fixed obstructions. Final system layout shall be acceptable to the Irrigation consultant.

3.3 EXCAVATION, TRENCHING, AND BACKFILLING

A. Excavating shall be considered unclassified and shall include all materials encountered, except materials that cannot be excavated by normal mechanical means.

B. Excavate to permit the pipes to be laid at the intended elevations and to permit work space for installing connections and fittings.

C. Minimum cover (distance from top of pipe or control wire to finish grade):

1. 20-inch over top of pipe mainline pipe.
2. 10-inch over control wire, follow local and state requirements if they dictate a deeper bury depth.
3. 20” top of lateral line for I-40 zones
4. 20” top of lateral for spray, MP and I-20 heads.

D. PVC mainlines to be trenched.

E. PVC lateral pipes 2-1/2” and smaller to be vibratory plowed in the soil using a vibratory plow device specifically manufactured for pipe pulling. Minimum burial depths equal minimum cover listed.

F. Backfill only after lines have been reviewed and tested.

G. Excavated material is generally satisfactory for backfill. Backfill shall be free from rubbish, vegetable matter, and stones larger than 2 inches in maximum dimension. Remove material not suitable for backfill. Backfill placed next to pipe shall be free of sharp objects, which may damage the pipe.

G. Backfill unsleeved pipe by depositing the backfill material equally on both sides of the pipe in 6-inch layers and compacting each layer to 90% Standard Proctor Density, ASTM D698-78. Use of water for compaction, “puddling,” will not be permitted.

H. Enclose pipe and wiring beneath roadways, walks, curbs, etc., in sleeves.Minimum compaction of backfill for sleeves shall reference geotechnical report for compaction requirements. Use of water for compaction around sleeve, “puddling,” will not be permitted.

I. Dress backfilled areas to original grade. Incorporate excess backfill into existing site grades.

J. Where utilities conflict with irrigation trenching and pipe work, contact the engineer/ irrigation consultant for trench depth adjustments.

K. Provide approved fine grained earth fill or sand to point 4” above the top of pipe, where soil conditions are rocky or otherwise objectionable.

L. Excavate trenches and install piping and backfill during the same working day. Do not leave open trenches or partially-filled trenches open over night.

M. The CONTRACTOR will be responsible for all finish and fine grading of trenches, disturbed areas around sprinklers heads, electric valves and any other excavated or disturbed areas by the CONTRACTOR. Contractor will also be responsible for all trench settling throughout the project during the one-year warranty period. If settling occurs, the contractor will repair and bring back to originally set grade.

N. When additional backfill material is needed to replace the unsuitable materials, it will be the CONTRACTOR'S responsibility and expense to supply such material.
It will also be the CONTRACTOR'S responsibility to dispose of the unsuitable material.

3.4 WORKMANSHIP

A. All work shall be done by qualified irrigation installers that are knowledgeable and experienced in operations they are performing. Installation methods, procedures and materials shall be in accordance with accepted industry practice and with standards of manufacturing and contracting associations applicable to the work. All work shall be neatly done with special emphasis on appearance of work exposed to view.

3.5 SLEEVING AND BORING

A. Install sleeving at a depth that permits the encased pipe or wiring to remain at the specified burial depth.

B. Extend sleeve ends 2 feet beyond the edge of the paved surface. Cover pipe ends and mark with stakes. Place a small chiseled "X" on the hard surface to mark the location of the sleeve.

C. Bore for sleeves under obstructions that cannot be removed. Employ equipment and methods designed for horizontal boring.

3.6 ASSEMBLING PIPE AND FITTING:

A. General:
1. Keep pipe free from dirt and pipe scale. Cut pipe ends square and debur. Clean pipe ends.
2. Keep ends of assembled pipe capped. Removed caps only when necessary to continue assembly.
3. All mainline and continuously pressurized pipe is to be installed using open trenches. Lateral pipe may be installed by "Plowing"

if soil conditions permit, and soils do not contain gravel, rock, construction debris, or other potential damaging material.

4. Trenches may be curved to change direction or avoid obstructions within the limits of the curvature of the pipe.

B. Mainline, lateral piping and Fittings:
   1. Use only strap-type friction wrenches for threaded plastic pipe.
   2. PVC Rubber-Gasketed Pipe:
      a. Use pipe lubricant. Join pipe in the manner recommended by manufacturer and in accordance with accepted industry practices.
      b. Epoxy-coated steel fittings shall not be struck with a metallic tool. Cushion blows with a wood block or similar shock absorber.
   3. PVC Solvent Weld Pipe:
      a. Use a primer and solvent cement. Join pipe in a manner recommended by the manufacturer and in accordance with accepted industry practices.
      b. Cure for 30 minutes before handling and 24 hours before allowing water in pipe.
      c. Snake pipe from side to side within the trench.
   4. Fittings: the uses of cross type fittings are not permitted.
   5. Install thrust blocks on the mainline pipe work in accordance with pipe manufacturer's written instructions.

C. Specialized Pipe and Fitting:
   1. Low-Density Polyethylene Hose: Install per manufacturer's recommendations.
   2. PVC Threaded Connections:
      a. Use only factory-formed threads. Field-cut threads are not permitted.
      b. Use only Teflon-type tape.
   3. Threaded Connections:
      a. Make metal-to-metal, threaded connections with Teflon-type tape applied to the male threads only.

D. Thrust Blocks:
   a. Use cast-in-place concrete bearing against undisturbed soil.
   b. Orientation and placement shall be as shown on the installation details, size per manufacturer's recommendations.
   c. Wrap fitting with plastic to protect bolts, joint and fitting from concrete.

3.7 INSTALLATION OF SPRINKLER AND IRRIGATION COMPONENTS:

A. Remote Control Valve (RCV) Assembly:
   1. Flush mainline before installation of RCV assembly.
   2. Install where indicated on the drawing. Wire connectors and waterproof sealant shall be used to connect control wires to remote control valve wire.
      Install connectors and sealant per the manufacturer's recommendations.
   3. Install only one RCV to a valve box. Locate valve box at least 12 inches from and align with nearby walls and edges of paved areas. Group RCV assemblies together where practical. Arrange grouped valve boxes in rectangular patterns. Allow at least 12 inches between valve boxes.
   4. Adjust RCV to regulate the downstream operating pressure.
   5. Attach ID tag with controller station number to control wiring.

B. Sprinkler Assembly:
   1. Flush lateral pipe before installing sprinkler assembly.
   2. Install per the installation details at locations shown on the drawings.
   3. Locate rotor sprinklers 6 inches from adjacent walls, fences or edges of paved areas.
   4. Locate spray sprinklers 3 inches from adjacent walls, fences or edges of paved areas.
   5. Install sprinklers perpendicular to the finish grade.
   6. Supply appropriate nozzle or adjust arc of coverage of each sprinkler for best performance.
   7. Adjust the radius of throw of each sprinkler for best performance.

3.8 INSTALLATION OF CONTROL SYSTEM COMPONENTS:

A. Irrigation Controller Unit:
   1. The location of the controller unit as depicted on the drawings is approximate the engineer/irrigation consultant/owner's representative will determine the exact site location during sprinkler layout review.
   2. Attach wire markers to the ends of control wires inside the controller unit housing. Label wires with the identification numbers (see drawings) of the remote-control valve to which the control wire is connected.
   3. Connect control wires to the corresponding controller terminal.

B. Control Wire:

1. For decoder systems, bundle control wires where two or more are in the same trench. Bundle with pipe wrapping tape at 15-foot intervals.
2. Control wiring may be chiseled into the soil using a vibratory plow device specifically manufactured for pipe pulling and wire installation. Appropriate chisel must be used so that wire is fed into a chute on the chisel, and wire is not subject to pulling tension. Minimum burial depth must equal minimum cover previously listed.
3. Provide a 24-inch excess length of wire in an 8-inch diameter loop at 90-degree change of direction, at both ends of sleeves and at 100-foot intervals along continuous runs of wiring. Do not tie wiring loop. Coil 24-inch length of wire within each remote-control valve box.
4. If a control wire must be spliced, make splice with wire connectors and waterproof sealant, installed per the manufacturer's instructions. Locate splice in a valve box that contains an irrigation valve assembly, or in a separate 10-inch round valve box.
5. Use same procedure for connection to valves as for in-line splices.
6. Protect wire not installed with PVC mainline pipe with a continuous run of warning tape placed in the backfill six inches above the wiring.
7. Allow 5 feet of extra wire on the decoder cable and allow 5' of extra wire for decoder to solenoid wiring to allow for above grade maintenance.

C. Instrumentation:
   1. Install sensor per the installation details and manufacturer's recommendations. Install at locations shown on the drawings.
   2. Install electrical connections between central control unit components and sensors per manufacturer's recommendations.

3.9 INSTALLATION OF OTHER COMPONENTS:

A. Tools and Spare Parts: Prior to the review at completion of construction, supply to the owner operating keys, servicing tools, spare parts, test equipment and any other items indicated in general notes on the drawings.

B. Other Materials: Install other materials or equipment shown on the drawings or installation details which are part of the irrigation system, even though such items may not have been referenced in these specifications.

3.10 BALANCING AND ADJUSTING

A. The Contractor will be responsible for the balancing and adjustments of the various components of the system, so the overall operation of the system is the most efficient. Including, but not limited to, the synchronization of the controllers, adjustments to the pressure regulator valves and sprinkler adjustments. Coordinate controller setup with Irrigation consultant.

3.11 REQUIREMENT FOR SUBSTANTIAL COMPLETION

A. Cleaning Equipment and Premises
1. Thoroughly clean all parts of the piping, valves and equipment.
2. Remove all construction debris, excess materials and equipment.

B. Operating and Maintenance Manuals
1. CONTRACTOR shall furnish to IRRIGATION CONSULTANT two operating manuals for furnished equipment. Information sheets shall be bound in standard three-ring binders labeled to show contractor's name, address, regular business phone number, emergency phone number and date. Operating manuals shall be submitted prior to completion of work to allow time for review. Manual shall contain following information:

List (keyed with identification numbers used) each item of equipment which requires service, giving the name of the item, model number, manufacturer's name and address, and providing the name, address and phone number of the nearest representative of authorized service organization.

Cut sheets to be included for the following, but not limited to: electric valves, isolation valves, swing joints, valve boxes, controllers and sprinkler heads.

2. A copy of the shop drawing for each item.
3. A complete operating and maintenance manual, parts list, wiring diagrams, lubrication requirements, and service instructions for each major item.
4. Complete control diagrams with description of all operation sequences and control devices.
5. Properly executed registrations and registered manufacturer's warranties.
6. After completion of work and when OWNER has had sufficient time to examine operating manuals and become somewhat familiar with operation of equipment, a meeting will be arranged by the Contractor with the Owner for purpose of instructing

OWNER in proper maintenance of system and to answer questions he/she may have regarding its operation. Prior to this meeting, contractor shall have programmed a base program for all stations and run times.

7. Contractor to complete the irrigation submittal for all irrigation systems to the IL State Public Health. Provide the owner with a copy of the submitted form.

3.12 MAINTENANCE:

A. Upon completion of construction and review by the engineer/irrigation consultant/owner's representative, maintain irrigation system for duration of 30 calendar days. Make periodic examinations and adjustments to irrigation system components to achieve the most desirable application of water.

B. Following completion of the "Contractor's" maintenance period, the owner will be responsible for maintaining the system in working order during the remainder of the guarantee/warranty period, for performing necessary minor maintenance, for trimming around sprinklers, for protecting against vandalism, and for preventing damage after the landscape maintenance operation.

3.13 OBSERVATION AND ACCEPTANCE:

A. Periodic site visits will be made by the Architect or Irrigation Consultant to review the quality and progress of the work. Work found to be unacceptable must be corrected within five (5) calendar days. Remove rejected materials promptly from the project.

B. Upon completion of the work, the Architect or Irrigation Consultant will issue a punch list for work to be corrected. Where work does not comply with requirements, replace rejected Work.

C. 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, final acceptance and all periodic site visits. Once the controllers are operational, the contractor will be required to have a tablet devise on site to operate the system. This tablet is to be accessible to the designer for any walk troughs that are scheduled.

D. If a site visit to verify Substantial Completion and final acceptance has been scheduled and the Architect or Irrigation Consultant arrives at the site and determines that the irrigation system is not substantially

complete or ready for final acceptance (all system components in place, operational and checked and arc and radius adjustments made) the Contractor shall be responsible for all costs incurred by the Architect or Irrigation Consultant to visit the site. Reimbursable expenses include but are not limited to the following: Mileage, airfare, consultants' time, parking fee, meals, rental car, etc. All incurred expenses will be deducted from the final contract amount.

3.14 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soils, debris and equipment. Repair damage resulting from sprinkler system installation.

END OF SECTION 328400

SECTION 33 1116 - SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe and fittings for Site water line, including domestic water line.
2. Gate valves, swing check valves, and backflow preventers.
3. Water meters.
4. Hydrants and yard hydrants.
5. Valve boxes.
6. Bedding and cover materials.

1.2 REFERENCE STANDARDS

A. Standard Specifications for Water and Sewer Construction in Illinois, current edition.

B. List reference standards included within text of this Section, with designations, numbers, and complete document titles.

C. ASTM International:
1. ASTM A48 - Standard Specification for Gray Iron Castings.
2. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
3. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
4. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
5. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
6. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
7. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series).
8. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
9. ASTM D2855 - Standard Practice for Making Solvent Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.
10. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
11. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
12. ASTM D6938 - Standard Test Method for In Place Density and Water Content of Soil and Soil Aggregate by Nuclear Methods (Shallow Depth).

D. American Water Works Association:
   1. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
   2. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
   3. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   4. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast.
   5. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
   6. AWWA C502 - Dry-Barrel Fire Hydrants.
   7. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-In. Through 24-In. (50-mm Through 600-mm) NPS.
   8. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.
   9. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.
   10. AWWA C606 - Grooved and Shouldered Joints.
   11. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
   12. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
   13. AWWA C702 - Cold-Water Meters - Compound Type.
   14. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
   15. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution.
   16. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In.(13 mm) Through 3 In.(76 mm), for Water Service.
   17. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,600 mm), for Water Distribution and Transmission.
   18. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

E. Manufacturer's Standardization Society of the Valve and Fittings Industry:
   1. MSS SP-60 - Connecting Flange Joint Between Tapping Sleeves and Tapping Valves.

F. Underwriters Laboratories Inc.:
   1. UL 246 - Standard for Safety Hydrants for Fire-Protection Service.

1.3 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data and Samples: Requirements for submittals.

B. Product Data: Submit data on pipe materials, pipe fittings, valves, and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents:

The Contractor shall keep on site a set of the plans to be maintained as the official project Record Drawings. The Contractor shall mark up the set of plans with any revisions in the drawings on a daily basis.

The Contractor shall record measurements to all reducers, bends, tees, and other buried fittings and appurtenances associated with the water and sewer construction. The Contractor shall also note field measurements to surface appurtenances such as manholes, cleanouts, valve boxes, curb stops, fire hydrants, or other permanent features.

The dimensions shall be indicated from physical features shown on the drawings. The Contractor shall take field measurements and indicate the measurements on the Record Drawings where the mains vary from the plan depth or grade. The Contractor shall deliver the Record Drawings to the Engineer, along with the final request for payment on the project.

1.5 QUALITY ASSURANCE

A. Perform Work according to AWWA and City of Rockford Water Department standards.

PART 2 - PRODUCTS

2.1 WATER PIPING

A. Ductile Iron Pipe: AWWA C151 and C111, Class 52 per City of Rockford requirements:
   1. Lining: AWWA Standard C104 and bituminous outer coating.
   2. Joints: Push-on per City of Rockford requirements, AWWA C111, rubber gasket with rods. Three brass wedges must be used at each joint for all push-on joints.
   3. Fittings: AWWA Standard C110 rated at 250 psi, cement mortar coated inside AWWA Standard C104, with mechanical joints AWWA Standard C111; All joints on fittings and valves shall be mechanical type MegaLugs by Ebba Iron or approved equivalent conforming to AWWA C-153 with ductile iron retainer glands. All mechanical joints shall be American made.
   4. All watermains placed in casings or sleeves shall have Cascade stainless steel spacers, style CCS, affixed to the pipe as suggested by the manufacturer. No alternatives are allowed.

B. Copper Tubing: ASTM B88-47, Type K, annealed for service lines up to and including two-inch (2”) diameter:
   1. Couplings: ASTM B62, waterworks bronze.

C. HDPE Piping
   1. Joints: The pipe is to be, joined by heat fusion, flanges or other mechanical joint systems proven for HDPE pipes. All joints shall, be

welded except for transitions to other materials. Mechanical joints shall have a stainless steel internal stiffener and joint restraint. Flanges shall be follower type, of ductile iron or stainless steel, *150-psi* pressure rated. Fittings shall be molded, or fabricated. Both pipe and fittings must be NSF listed by the manufacturer with the pipe bearing the NSF 61 logo or mark and, pressure rating.

2. Pipe: Pipe shall be high molecular weight, high density polyethylene (HDPE)., Iron Pipe Size with a dimension ratio of 13.5. The material shall be appropriate for potable water and shall be, listed by Plastic Pipe Institute (PPI) with a designation of PE 3408 and have a minimum cell classification of 345434, or D as described in ASTM D3350. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material pipe. Pipe and fittings shall be the same material and class, made in conformance with ASTM F714, and joined in accordance with ASTM D3261.The pipe shall be homogeneous throughout and free of cracks, holes, foreign inclusions or other injurious defects. Pipe shall be uniform in density and other physical properties.The HDPE pipe for Horizontal Directional Drilling (HDD) installation shall be Thermal Butt-Fusion Welded Joints. Friction or pressure couplings are, not allowed. Flanged joints with SS backup flanges shall be, used as transitions to different pipe materials. Butt Fusion technique shall meet all requirements of ASTM D2657, D3261 and in accordance with pipe manufacturer requirements and recommendations.
3. HDPE Fittings: All fittings shall be, provided as indicated on the plans. HDPE fittings shall be of the same material and class as the pipe and shall be, manufactured by the manufacturer of the pipe. HDPE elbows, tees and wyes shall be, manufactured by mitered fabrication. The manufacturer shall have a written specification for all standard mitered fittings, which establishes Quality Control criteria and tolerances. Mechanical Joint anchor fittings (MJ Adapter) shall be used to transition from Ductile Iron Pipe to HDPE pipe. The fittings shall be stronger than the pipe when it is, subjected to tensile stress where the pipe will pull apart before the fitting will pull out and, the pipe will rupture before the fittings will burst under pressure. Compression type connections are, strictly not allowed
4. Alignment of Horizontal Directional Drilling:. No damage, settlement or heave shall be, allowed to occur to surrounding utilities, pavements or other structures.
5. Contractor shall meet the Certification and Testing Requirements and Required Design Criteria of the City of Rockford Water Department Standards.
6. A tracer wire shall be laid with all HDPE water services and shall be of insulated, #8 solid copper core and rated for underground service. The start of the tracer wire shall be connected to the City's copper water service by means of a brass ground clamp. The wire shall be ran along the length of the HDPE pipe, with plastic adhesive tape applied at intervals of approximately ten (10) feet along the pipe length. The wire

shall terminate at the meter connection by means of a brass ground clamp with at least two (2) inches of bare copper wire exposed

2.2 HORIZONTAL DIRECTIONAL BORING

A. Directional boring/drilling installation shall be accomplished where required on the Plans or in the Special Conditions to minimize disturbance of existing surface improvements. The Contractor shall be compensated for the restoration work only within the areas at the connection points, or other locations as may be approved by the Engineer. The Contractor shall be responsible for repairs, without compensation, for any other repair areas, including pit/boring points and areas above the drilled pipe where underground pressure may cause heaving or damage to pavement and ground surfaces.

B. The Contractor must submit boring/drilling pit locations to the City and the Engineer for approval before beginning construction. Boring pits may be located within roadway right-of- way and easements as authorized by the City of Rockford. Any other locations that may be desired by the contractor for boring pits or other uses shall be the responsibility of the Contractor to attain authorization, including private property as may be required.

C. The drilling equipment shall be capable of placing the pipe as shown on the plans. The installation shall be by a steerable drilling tool capable of installing continuous runs of pipe without intermediate pits, at a minimum distance and radius requirements per the manufacture's specification and recommendations. The guidance system shall be capable of installing pipe within 6-inches of the plan vertical dimensions required to remove and reinstall pipe, which vary in depth and alignment from these tolerances.

D. Pull back forces shall not exceed the allowable pulling forces for the pipe being installed. The minimum radius of the pipe shall be per the manufacture's specification and recommendations. Drilling fluid shall be a mixture of water and benonite clay and shall be designed for existing soil conditions. Disposal of excess fluid and spoils shall be the responsibility of the Contractor.

2.3 GATE VALVES

A. Manufacturer List:
   1. 4" to 12": Mueller Company A2360-2 Resilient Wedge Gate Valve with a two-inch square nut – open left. No alternatives are allowed.
   2. 12" and Larger: Mueller B3211-20 Mechanical Joint Butterfly Valves conforming to AWWA C504 with a two-inch square nut – open left. No alternatives are allowed.

B. 4 in and Larger: AWWA C500, iron body, bronze trim, non-rising stem with square nut, single wedge, mechanical joint ends AWWA C111, control rod, and valve box**.** Gate valves shall be furnished with "O" ring stem seals.

C. Mark manufacturer's name and pressure rating on valve body.

D. All valve boxes shall be Tyler 6850 or 6860D cast iron three piece box or approved equivalent. Valve boxes shall be American made.

2.4 CORPORATION AND CURB STOP VALVES

A. Manufacturer List: Per City of Rockford requirements.

B. Corporation stop valves shall be manufactured of waterworks bronze (ASTM B62), with full diameter stop orifice, and thread patterns conforming to AWWA Standard C800 figure 1 for Type K copper service tube.

Design and dimension of corporation stops must conform, with Mueller H-15000 stops, or City of Rockford Water Department approved equal, to allow use in the City's tapping machines.

Corporation stop valves shall be, furnished in one (1) inch, one and one-half (1-1/2) inch and two (2) inch sizes for use with Type K copper tubing in the same standard water tube sizes.

Corporation stop valves shall be furnished with compression joints complying with Copper Compression Joint Specifications.

C. Curb Stop Valves:

Curb stop valves shall be manufactured of waterworks no—lead brass (ASTM Standard B62), with full round top orifices, and ninety (**90**) degree stop rotation. Tee heads must be designed for connection to curb box shut-off rods similar to Mueller #82865 or #580563.

Curb stop valves shall be "O" ring seal plug or ball types. Inverted or tapered plug valves, as well as stop and waste designs, are not accepted.

Curb stop valves shall be, furnished in one (1) inch, one and one-half (1-1/2) inch, and two (2) inch sizes for use with Type K copper tubing.

Copper joints on curb stop valves shall be compression type, complying fully with the specifications in Copper Compression Joint Specifications.

D. Curb Stop Boxes:

1. Curb stop boxes shall be extension type, with arch pattern bases, for a nominal six (6) foot trench depth. Upper sections shall be of steel and shall telescope a minimum of twelve (12) inches. Provisions shall be made to prevent the upper sections from turning or from pulling out of the base sections.
2. Upper sections for three-quarter (3/4) inch and one (1) inch curb stop boxes shall be one (1) inch size. Upper sections for larger curb stop boxes shall be one and one-quarter (1-1/4) inch in size. The base sections shall be adequately sized to accommodate Mueller Oriseal pattern curb stops.
3. Stationary rods thirty-six (36) inches long shall be furnished with curb stop boxes. Rod design shall center the upper end of the rod in the upper box section.
4. Lids shall be furnished with curb stop boxes. Lids shall have brass bushings iron pipe threaded, and shall be cast with lettering to indicate a water service valve.

5. Curb stop boxes shall be coated, inside and outside, with coal tar enamel. Stationary rods and lids shall also be coated with coal tar enamel.
6. The following manufacturers are listed as offering curb stop boxes in essential compliance with these specifications. Manufacturers other than those listed may be acceptable, and will be given full consideration, provided the supplier can satisfy the City that these specifications are met.

Stop size	Manufacturer	Box Number	Lid Number
1-1/2 & 2	A.Y. McDonald	5603ALR	5601-L
1-1/2 & 2	Mueller	H-10386	89981

2.5 SERVICE SADDLES

A. Service saddles shall be of the double strap type in pipe sizes up to sixteen (16) inch, and triple strap in larger pipe diameters. Saddles shall be designed for a working pressure of three hundred (300) PSI.

B. Outlet opening shall be furnished with **AWWA "CC"** type tapered threads in one and one-half (1-1/2) inch, and two (2) inch sizes.

C. The saddle body shall be made of ductile iron with and enamel coating, and The saddle body shall be made of ductile iron with an enamel coating, and complying with **ASTM Standard A536**. Straps and nuts shall be made of forged low alloy steel, electro- galvanized with di-chromate seal and conforming to **ASTM Standards A108** and **B633**. The inlet gasket shall be of "Buna-N" rubber, cemented in place.

D. In soils considered to be corrosive, service saddle material of construction shall be: Saddle body made of waterworks no-lead brass, with straps and nuts made of silicon bronze, all in compliance with AWWA Standard C800.

E. The following manufacturers are listed as offering service saddles in essential compliance with these specifications. Responsibility rests with the supplier to demonstrate that a particular saddle fully complies with these specifications. **Manufacturers other than those listed may be acceptable, and will be given full consideration, provided the supplier can satisfy the City that these specifications are met.**

1. Smith-Blair, Incorporated, Texarkana, Texas
2. Ford Meter Box Company, Wabash, Indiana

2.6 SERVICE FITTINGS

A. Service fittings shall be manufactured of waterworks bronze **(ASTM B-62)**.

B. Services fittings shall be, furnished in one (1) inch, one and one-half (1-1/2) inch, and two (2) inch sizes for use with **Type K** copper tubing or HDPE pipe in the same standard water tube sizes.

Copper or HDPE joints on service fittings shall be furnished with compression joints complying with City of Rockford standards .

2.7 RESTRAINED GLANDS

A. Restrained glands shall be cast from ductile iron and machined to dimensions and/or tolerances hereinafter specified either directly or by reference.

B. Restrained glands shall be designed for use in place of standard glands for AWWA Standard C111 (ANSI Standard A21.11) mechanical joints. The approved restrained gland type shall be:

C. (a) Individually activated wedge type gland *(e.g. Megalug style; Uniflange style)* shall be used for restraint due to its increased resistance to joint separation as pressure or external forces increase and its ability to provide joint resiliency and deflection. The wedge type gland shall have a working pressure up to three hundred fifty (350) psi. in main sizes through sixteen (16) inches, and two hundred fifty (250) psi. in larger sizes along with a minimum safety factor of 2:1. The wedges shall be ductile iron heat treated to a minimum hardness of 370 BHN. It shall also have individual activated wedge screws with specially engineered heads designed to break off when desired torque is reached, leaving a hex head in case future removal is required.

D. Restrained glands shall be used on all water mains, hydrant and large service branches, which have vertical down and vertical up bends and any intermediate joints between those bends. Joint restraint will also be required on at least two (2) full pipe lengths of the horizontal run either side of the bend.

E. On horizontal bends; pipe size, angle of bend, maximum system pressure, soil classification and moisture content, depth of bury, type of trench bedding and compaction and whether or not the pipe is polyethylene wrapped, will all be used in calculating the pipe length to soil friction needed for proper joint restraint on either side of the bends. On bridges or other special situations requiring joint restraint, the method of restraint shall be determined by the City of Rockford Water Department.

F. Hydrant installations including the branch end of the tee, as well as the pressure side of distribution valves used at main dead ends, will also require the use of restrained glands.

G. Restrained glands shall be furnished factory coated with bituminous material meeting the requirements for outside coatings of AWWA Standard C151 (ANSI Standard A21.51).

2.8 YARD HYDRANTS

A. Yard hydrants shall be provided at the locations shown on the Construction Drawings near the baseball and softball dugouts.

B. Yard hydrants shall be Freezeless Utility Yard Hydrants, model U150M, 1-1/2”, manufactured by Woodford. Inlet shall have a 1-1/2” brass valve body, FPT and

outlet shall have a 1-1/2” galvanized tee. Handle type shall be provided by owner.

2.9 FIRE HYDRANTS

A. Fire hydrants shall fully comply with all of the requirements contained in the City of Rockford Water Department requirements, and the general provisions of the latest revision of AWWA Standard C502 and with the special requirements hereinafter provided. In case of a discrepancy between the two above referenced specification documents, the City of Rockford requirements shall prevail.

B. The inlet connection shall be six (6) inch oversized mechanical joint type, which is designed to be installed on Class D Pit Cast or Class 250 Cast Iron pipe and Class 52 Ductile Iron pipe by using two (2) types of available gaskets furnished with the hydrant. Gaskets for oversized cast iron and ductile iron are to be color coded to identify which gasket is to be used on which pipe. The interior shoe and lower valve plate shall be coated with an epoxy at a minimum of four (4) mils thickness. Ductile iron restrained retainer glands, bolts, nuts, and gaskets, shall conform to AWWA Standard C111.

C. The main valve shall be five and one-quarter (5-1/4) inches in size, closing with water pressure. The upper valve plate and seat ring shall both be of solid, one-piece bronze construction, and the seat ring shall be attached to the hydrant shoe by threading into a bronze fitting. The zinc content in the bronze shall not exceed sixteen (16) percent. The main valve assembly shall include provisions to restrain movement of the main valve and stem in any direction other than parallel to the axis of the stem.

D. Lower barrel length shall be based on a nominal six (6) foot bury (trench) depth. Barrel and stem extensions shall be available in six (6) inch lengths and longer lengths in increments of six (6) inches. The manufacture's name, size of main valve opening, and year of manufacture shall be cast in the upper barrel of the hydrant.

E. Installation of large diameter water mains may require ordering a longer lower barrel section to meet the water main bury requirements. Likewise, replacing obsolete hydrants in existing subdivisions, which might be less than six (6) foot trench cover, may require a shorter lower barrel section (see Section 2.7 on Trench Depth & Section 3.5 on Setting Hydrants).

The outlet connections shall be:

(a) One (1) four (4) inch pumper nozzle, 5.0109 inch ODM, 4 TPI (NHT).

(b) Two (2) two and one-half (2-1/2) inch hose nozzles, 3.0686 inch ODM, 7-1/2 TPI (NHT).

F. Nozzles shall be fastened mechanically into the upper barrel and have the nozzle caps chained to the upper barrel. Leaded in nozzles shall not be allowed. The centerline of all nozzles shall be no less than eighteen (18)

inches, but not more than twenty-four (24) inches above the groundline bury mark on the lower barrel of the hydrant.

G. Both hydrant operating nut and nozzle cap nuts shall be one (1) inch square at the base tapering to seven-eighths (7/8) inch at the top and not less than one (1) inch in height. The hydrant-operating nut shall turn right (clockwise) to open.

H. Hydrants shall be of the "break-away" flange and stem coupling design. The breakaway design shall allow for three hundred sixty (360) degree facing nozzles by infinite degrees. Safety stem coupling shall be of frangible design, which provides for a clean break or tear into halves upon impact. Stem coupling shall be secured to the stem with stainless steel pins and fasteners.

I. All fire hydrants, public and private, shall have a Harrington Integral Hydrant Storz nozzle installed on hydrants during assembly and shall meet or exceed the requirements of AWWA C502 regarding material and pressure testing. The Storz nozzle shall have a brass metal face seal and hard anodized aluminum Storz ramps and lugs. The aluminum's finish shall be hardcoat anodized to Mil-A-8625f, Type 3, dark gray. The adapter shall be made of forged or extruded 6061-T6 aluminum. The blind cap shall have hard anodized aluminum Storz ramps and lugs, made of forged or extruded 6061-T6 aluminum. The center cap shall be equipped with a suction seal. The cap shall be connected to the adapter of the hydrant with a 0.15" vinyl coated aircraft cable.

J. Fire hydrants installed in public R.O.W. and in easements maintained by the City, shall have the upper barrel, above the groundline, painted a minimum of one (1) coat of "Yellow" Rustoleum Industrial grade Iron Oxide Primer and two (2) finish coats of "Traffic Yellow" Rustoleum Industrial grade oil base Alkyd Enamel. Hydrants installed on private property, in conjunction with the owners fire protection system, shall be painted "Red". Painting and coatings shall be in accordance with AWWA Standard C502.

K. Hydrant Lubrication

L. Each threaded nozzle and cap, shall be coated with a premium, synthetic, food grade, non-drying thread sealant and anti-seize compound, approved by the specific hydrant manufacturer, immediately before or after installation.

M. Approved Hydrants

Only manufacturers and models which are accepted by the City Rockford shall be supplied by the Contractor.

2.10 VALVE BOXES

Valve Boxes shall be Tyler/Union cast iron 6850 series, with "WATER" imprinted on top cover with a debris cap and with an Adapter II by Adaptor Inc. installed.

2.11 REDUCED PRESSURE BACKFLOW PREVENTER

The Reduced Pressure Principle Backflow Preventer shall be certified to NSF/ANSI/CAN 61 and 372, ASSE® Listed 1013, rated to 180°F, and supplied

with full port ball valves. The main body shall be Nylon and the seat disc elastomers shall be silicone. The installation shall be supplied with an air gap adapter. The Reduced Pressure Principle Backflow Preventer shall be a ZURN WILKINS Model 375XL, or approved equal

2.12 TRENCH DEPTH AND BACKFILL

A. Trenches shall be excavated to a depth sufficient to provide a minimum cover of six (6) feet, and a maximum cover of eight (8) feet from the top of the pipe to the finished ground surface. Trench depth shall be increased where necessary so that the main is installed on a uniform gradient despite minor local variations in surface grade.

B. All trenches shall be backfilled, from the bottom of the trench to the centerline of the pipe, with FA-6 or approved native material. The backfill material shall be deposited in the trench for its full width on each side of the pipe simultaneously, distributed evenly by hand, and compacted by tamping.

C. All trenches shall be backfilled, from the centerline of the pipe to a depth of one (1) foot above the top of the pipe, with FA-6 or approved native material compacted by tamping. The contractor shall use special care in placing this portion of the backfill so as to avoid injuring or moving the pipes.

D. When the type of backfill is not indicated in the plans, or elsewhere specified, the trench shall be backfilled, from one (1) foot above the pipe to the finished grade, with native material, or other materials approved by the City, in twelve (12) inch layers compacted by tamping. The material shall be unfrozen and free from clods and rocks.

E. Granular backfill is required under pavements, curbs, driveways, or sidewalks planned to be constructed within one (1) year after backfill. The area requiring such granular backfill shall be indicated in the plans. Where the excavation is made through or within two (2) feet of permanent pavements, curbs, driveways, or sidewalks, or where such structures are undercut by the excavation, or where such structures may reasonably be expected to be constructed over or within two (2) feet of the excavation within one (1) year after backfilling, the entire backfill to the subgrade of the structures shall be made with CA-6 material or an equal granular material approved by the City, placed in six (6) inch layers, loose measurement, and compacted to not less than ninety-five (95) percent of standard laboratory density. Recycled materials meeting the CA-6 gradation in accordance with the Illinois Department of Transportation's Standard Specifications for Road and Bridge Construction may be allowed upon review and approval by the City of Rockford.

2.13 THRUST BLOCKS

A. The parameters involved in the design of thrust blocks shall include pipe size, maximum system pressure, angle of the bend, (or the configuration of the fitting), and the horizontal bearing strength of the soil. Bearing surface should, where possible, be placed against undisturbed soil. Where it is not

possible, the fill between the bearing surface and undisturbed soil must be compacted to at least 90% Standard Proctor density.

B. Thrust blocks shall be used wherever there is a change in horizontal direction, and on dead ends. On vertical down and vertical up bends, restrained glands are required (see Section 2.4 Restrained Glands). Thrust block size shall be determined by Rockford Water Department.

C. Thrust blocks shall be P.C. concrete, a minimum twelve (12) inches thick, formed between the pipe, or fitting and the undisturbed trench wall, and shall be, anchored in such a manner that the pipe and fitting joints will be accessible for repairs.

D. Recommended alternative to thrust blocking in most situations would be the use of Restrained Glands (see Section 2.4).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 – Contract Closeout: Requirements for installation examination.

B. Verify building service connection and water main size, location, and invert are as indicated on Drawings.

3.2 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

D. Protect and support existing distribution piping and appurtenances as Work progresses.

3.3 BEDDING

A. Excavate pipe trench according to Section 31 2000 for Work of this Section.

B. Form and place concrete for pipe thrust restraints at change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide **3 sq ft** thrust restraint bearing on undisturbed subsoil.

C. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 in compacted depth; compact to 95 percent.

D. Backfill around sides and to top of pipe with cover fill, tamp in place, and compact to 95 percent.

E. Maintain optimum moisture content of fill material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Water mains shall, in general, be located between the curb and sidewalk. Water mains parallel to curbs shall be located at least two (2) feet from the back of the curb.

B. All water mains shall be looped except where cul-de-sacs can be served by mains five hundred (500) feet or less in length.

a.) Water mains shall be constructed within the public Right-Of-Way whenever possible.

b.) When it is necessary to construct a water main on private property, an exclusive water main easement shall be granted to the Water Division, extending a minimum of ten (10) feet on either side of the main and shall be recorded with the final plat.

c.) No water main shall be laid under, nor within ten (10) feet of, any building or permanent structure.

C. Water mains and services shall be laid at a uniform grade between main junctures. Where a uniform grade is not possible, the grade shall be designed so that the number of changes in the direction of slope is the minimum possible.

a.) Where both ends of a section of main are at a lower elevation than an intermediate point, a means of releasing entrapped air (e.g. fire hydrant, air release valve) must be provided at the top of the "hill".

b.) Where both ends of a section of main are at a higher elevation than an intermediate point, a means of flushing out sediment through a fire hydrant must be provided at the bottom of the "valley."

The minimum radii of curves which may be laid by deflecting twenty (20) foot lengths of push-on joint pipe at the joints are:

8" - 230' radius
12" - 230' radius
16" - 380' radius
20" - 380' radius
24" - 380' radius
30” - 380’ radius
36” - 380’ radius

a.) Curve radii shall be measured in the plane defined by centerlines of the pipe.

b.) Curves with smaller radii than permitted above shall be made using bends and offsets.

D. No water main shall pass through or come into contact with any part of a sewer manhole or storm sewer inlet structure.

E. Horizontal and vertical separation between water mains, water appurtenances and all storm and sanitary sewers, and appurtenances, or other sewerage structures shall be as follows:

a.) Whenever possible, water mains shall be laid no less than ten (10) feet horizontally from any existing or proposed drain, storm sewer, sanitary sewer, combined sewer or sewer service connection.

b.) When it is impossible to accomplish a ten (10) feet horizontal separation between a water main and a sewer, the bottom of the water main must be at least eighteen (18) inches above the top of the sewer and the water main and sewer must be constructed in separate trenches. Where separate trenches are not possible, the water main must be constructed on a shelf of undisturbed earth located as far as possible from the sewer.

c.) When it is impossible to accomplish the separations required above, both the water main and the sewer must be constructed of water main materials and the sewer must be pressure tested for water tightness at the maximum expected surcharge head before backfilling.

d.) Whenever a water main crosses a sewer, the bottom of the water main must be at least eighteen (18) inches above the crown of the sewer for all portions of the water main located less than ten (10) feet from the sewer.

e.) When it is impossible to accomplish the vertical separation required above, both the water main and the sewer must be constructed of water main materials and the sewer must be pressure tested for water tightness at the maximum expected surcharge head before backfilling. Wherever the water main is less than ten (10) feet from the sewer, a full twenty (20) foot length of water main pipe shall be centered at the point of sewer crossing.

f.) In addition to the above, when it is necessary that a water main cross under a sewer the bottom of the sewer must be at least eighteen (18) inches above the crown of the water main for all portions of the water main located less than ten (10) feet from the sewer. The sewer must also be supported to prevent settling and breaking of the water main.

F. Water mains and services shall have a minimum cover of six (6) feet, and a maximum cover of eight (8) feet from the top of the pipe to the finished ground surface. Any variation from this policy is at the discretion of the City of Rockford Water Department.

a.) If acceptable to the City of Rockford Water Department, water mains and services with less than five-foot (5) of cover shall be insulated. A ½-inch thick closed cell foam insulation is to be wrapped around shallow services and then an Insulation board (polystyrene) is to be laid, over top of main and service. The 4'x 8' standard boards shall orientate to provide a minimum coverage of eighteen (18) inches beyond the outside edge of the pipe being, covered. The insulation board shall have a minimum R-value of R-9 and comply with ASTM C 578-92 Type 1X. One 2-inch thick sheet of insulation is equivalent of 1 foot of ground cover when determining thickness requirements.

b.) All water main and services shall have a plastic caution tape placed in the trench approximately 3 feet above the top of the pipe to warn excavators of the nearby pipe. The tape shall be yellow with black lettering and 4 inches in width.

3.5 INSTALLATION - VALVES AND HYDRANTS

A. Water main valves shall be located on right-of-way lines extended, or lot lines extended, unless otherwise shown on the plans.

a.) Three (3) valves shall be installed at each cross fitting, two (2) valves at each tee fitting, and one (1) valve on each hydrant branch.

b.) Additional mainline valves shall be installed as needed so that no more than five hundred (500) feet of main will be isolated by any shut-off.

c.) Valves shall be arranged so that no more than four (4) need be closed to isolate any section of main.

d.) Access to the valve shall be through a cast iron valve box.

B. Valves less than (12) inches in size shall be *"gate valves"*. Valves twelve (12) inches and larger in size shall be *"butterfly valves".*

C. A cast iron valve box shall be provided for every valve, complying with Section 2.6 of these specifications. The valve-operating nut shall be readily accessible for operation through the valve box opening, which shall be set flush with the finished surface.

D. When valve vaults are required, they shall be constructed of concrete block, concrete brick laid up in alternate courses of headers and stretchers, or precast concrete, placed upon a concrete foundations ring (4) four inches thick with a minimum outside diameter of five (5) feet. Precast concrete base or foundation ring shall be placed on a well-graded granular bedding material not less than six (6) inches thick, extending to the limits of the excavation. The bedding course shall be firmly tamped and made smooth and level. Concrete block or brick shall be set in mortar with the vertical joints broken to provide drainage. The cone of the vault shall be no more than thirty-six (36) inches in height and at grade shall accept the manhole rim and cover specified below.

E. Manhole rims and covers shall be of “light” construction when located outside of paved surfaces; of “heavy” construction when located in paved surfaces; and of “extra heavy” construction when located in paved surfaces designated by the City as major arterial streets.

3.6 BACTERIOLOGICAL DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. After the backfill has been completely made, the contractor shall disinfect the pipeline in compliance with the provisions of AWWA Standard C651 and the provisions herein specified.

B. Prior to disinfection, the pipeline or valved section thereof, shall be flushed at a minimum flow velocity of two and one-half (2-1/2) feet per second. Following full development of flow, flushing shall continue until the discharge runs clear or until the City direct flushing operations to cease. In no event shall the duration of flushing be less than ten (10) minutes. Water used in flushing shall be introduced into the pipeline at a point of connection with the existing distribution system designated by the City.

C. After flushing, the water main shall be disinfected in accordance with AWWA Standard C651. Water used in disinfecting the pipeline shall be introduced into the pipeline through the pressure test connection made under the provisions of Section 3.7 Hydrostatic Testing.

D. Bacteriological sampling shall be collected from the pipeline following disinfection and final flushing. Samples shall be delivered to the City of Rockford Water Testing Laboratory for analysis. Contact Matt Baillergeon 779-348-7355 for location of Water Testing Laboratory. Samples must be submitted in Laboratory approved bottles that must be obtained from the laboratory. A Coliform Analysis Report shall be submitted with each sample (also available at this address) and shall indicate the chlorine residual (either free or total) at the time the sample was collected Failure to record the residual shall result in the rejection of the sample. If the sample shows the presence of coliform organisms, the contractor shall be notified (contact information MUST appear on the bacteriological form) and repeat the disinfection procedure. On resampling, two (2) consecutively passing samples collected on successive days (a minimum of 24 hours between sampling) shall be required.

E. If valved sections of the pipeline are disinfected separately, each section will be considered a separate pipeline for disinfection, flushing and sampling.

F. The City of Rockford will retain a copy of all bacteriological laboratory reports and submit results to the Illinois EPA as required. A copy of the bacteriological report shall also be sent to the City Water Engineering Supervisor and the Contractor. This work will be incidental to the contract and will not be considered for further payment.

3.7 HYDROSTATIC TESTING

A. After the pipe has been laid and partly backfilled as specified, all newly laid pipe or any valved sections of it shall, unless otherwise expressly specified, be subjected to a hydrostatic pressure equal to fifty (50) percent more than the operating pressure at the lowest elevation of the pipe section, but not to exceed the pressure rating of the type of pipe specified. The duration of each pressure test shall be for a period of not less than one hour and not more than six hours. The basic provisions of AWWA C-600 and C-603 shall be applicable.

B. Each valved section of pipe shall be, slowly filled with water and the specified test pressure applied. Before applying the specified test pressure, all air shall be expelled completely from the pipe, valves and hydrants. If permanent air vents are not specified, the contractor shall install corporation stops at all points located at a higher elevation than the immediately adjacent sections of main so that air can be expelled as the line is filled with water. After air has been expelled, corporation stops shall be closed and test pressure applied.

C. After test pressure has been reached and the system allowed to stabilize, not more than plus or minus five pounds per square inch gauge (+or- 5 PSIG) deviation will be allowed for the duration of the test.

D. All exposed pipe, fittings, valves, hydrants and joints shall be carefully examined. All joints showing visible leaks shall be repaired by the contractor. Any cracked or defective pipe, fittings, valves, or hydrants discovered in consequence of the pressure test shall be removed and replaced by the contractor. The test shall be repeated until satisfactory to the City.

E. A leakage test shall be conducted if the pressure test cannot be satisfactorily completed. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved sections thereof, to maintain pressure within five pounds per square inch (5 PSI). Leakage **shall not** be measured by a drop in pressure in a test section over a period of time.

F. No pipe installation will be, accepted if the leakage is greater than specified in AWWA Standard C600-87, which is, determined by the following formula:

$$L = \frac{SD\sqrt{P}}{148{,}000}$$

where,

L = allowable leakage, in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches

P = average test pressure during the leakage test, in pounds per square inch

END OF SECTION 33 1116

SECTION 334000 - STORM DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Storm sewer drainage piping, fittings, and accessories.
2. Storm drainage structures.

1.2 Related Requirements:
1. Section 312000 – Grading
2. Section 312500 – Erosion and Sedimentation Control
3. Section 334913 - Sewer Manholes, Frames, and Covers
4. Division 3- Concrete: See Architectural / Building Specifications
5. Stormwater Pollution Prevention Plan

1.3 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. American Association of State Highway and Transportation Officials (AASHTO):
1. AASHTO M 170 – Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
2. AASHTO M 190 - Bituminous Coated Corrugated Metal Culvert Pipe and Arches.
3. AASHTO M 198 - Joints for Circular Sewer and Culvert Pipe Using Flexible Watertight Gaskets.
4. AASHTO M 252 - Corrugated Polyethylene Drainage Tubing, 3 to 10 Inch Diameter.
5. AASHTO M 294 - Corrugated Polyethylene Drainage Tubing, 12 to 60 Inch Diameter.

C. ASTM International (ASTM):
1. ASTM A 74 - Cast Iron Soil Pipe and Fittings.
2. ASTM A 185 - Steel welded Wire Fabric, Plain, for Concrete Reinforcement.
3. ASTM A 615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
4. ASTM A 746 - Ductile Iron Gravity Sewer Pipe.
5. ASTM A 760 - Corrugated Steel Pipe, Metallic-Coated For Sewers And Drains.
6. ASTM A 796 - Structural Design Of Corrugated Steel Pipe, Pipe-Arches, And Arches For Storm And Sanitary Sewers And Other Buried Applications.
7. ASTM A 798 - Factory-Made Corrugated Steel Pipe For Sewers And Other Applications.
8. ASTM A 929 - Steel Sheet, Metallic-Coated By The Hot-Dip Process For Corrugated Steel Pipe.
9. ASTM C 76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
10. ASTM C 150 - Portland Cement.
11. ASTM C 206 - Finished Hydrated Lime.

12. ASTM C 443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
13. ASTM C 564 - Rubber Gasket for Cast Iron Soil Pipe and Fittings.
14. ASTM C 924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
15. ASTM C 969 - Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
16. ASTM C 990 - Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
17. ASTM D 3034 - Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
18. ASTM D 3212 - Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
19. ASTM F 477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
20. ASTM F 949 - Poly (Vinyl Chloride)(PVC) Corrugated Sewer Pipe with Smooth Interior and Fittings.
21. ASTM F 1417 - Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.
22. ASTM F 2306 - 12 to 60 Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.

D. American Concrete Institute (ACI):
   1. ACI 301 - Structural Concrete for Buildings.

E. UNI-Bell PVC Pipe Association:
   1. UNI-B-6 – Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe.

1.4 SUBMITTALS

A. Project Record Documents:
   1. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.5 PROJECT CONDITIONS

A. Coordinate work with termination of storm sewer connection outside building including connection to municipal storm sewer system.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Pipe and joint materials specified below for storm drainage shall be strictly limited to the extent shown or allowed on the drawings or as specified in Part 3 hereinafter.

B. Reinforced Concrete Pipe (RCP): ASTM C 76, Class III unless noted otherwise on Drawings.
   1. Joint Material: Provide joints to the extent allowable in Part 3 Joints.
      a. Rubber O-ring Gasket: AASHTO M 198, Type B or ASTM C 443.
      b. Bitumen or Butyl-Rubber Sealant: ASTM C990.
   2. Flared End Sections: ASTM C 76 or, for sections with toe wall, AASHTO M 170.

C. High Density Polyethylene Pipe (HDPE): AASHTO M 252 Type S, M 294 Type S, or ASTM F 2306 smooth interior/annular exterior. Use only where specifically indicated on Drawings.
   1. Joint Material:
      a. Rubber Gasket.
         1) ADS N-12 WT by Advanced Drainage Systems, Inc.
         2) ADS N-12 ST by Advanced Drainage Systems, Inc.
         3) BLUE SEAL by Hancor, Inc.
         4) Sure-Lok by Hancor, Inc.
      b. Corrugated Coupling Bands.
         1) Hi-Q by Hancor, Inc.
         2) ADS N-12 by Advanced Drainage Systems, Inc.
      c. PE Wrap.

D. Polyvinyl Chloride (PVC) Pipe: ASTM D 3034, rated SDR 35, or ASTM F 949 for Profile Pipe, continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D3034 classification. Only permitted when specifically indicated on Drawings.
   1. Pipe joints conforming to ASTM D 3212.
   2. Joint Material: Restrained Gasket, ASTM F 477.

E. Subdrains: Perforated, PVC or flexible corrugated plastic pipe as specified herein of the size indicated on the drawings.

2.2 DRAINAGE STRUCTURES

A. Manholes: Conform to Section 334913.

B. Grates and Frames: Provide in accordance with details shown on Drawings or equivalent by one of the acceptable manufacturers.
   1. Acceptable Manufacturers:
      a. Bass & Hays Foundry.
      b. Deeter Foundry, Inc.
      c. East Jordan Iron Works.
      d. Neenah Foundry.
      e. U.S. Foundry & Manufacturing.
   2. Standard Grates and Frames: Heavy duty grates, with maximum slot width of 1-1/8”.

C. Cast-In-Place concrete for drainage structures including manholes, inlets, catch basins, collars, support blocks, headwalls and paved ditches shall conform to ACI 301.

1. Compressive Strength: 3500 psi at 28 days.
2. Reinforcement: ASTM A 615, grade 60 deformed reinforcing bars, and ASTM A 185 for wire fabric.

D. Cement Mortar used for paving inverts, filling lift holes, joints, patching and anchoring castings shall consist of one part Portland cement, type I, ASTM C 150, 1/4 part hydrated lime, ASTM C 206 and 2-1/2 parts clean, well-graded sand and water free of suspended matter, alkali, and containing no industrial or domestic waste.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over-excavation with bedding material.

B. Remove large stones or other hard matter that could damage piping or impede consistent backfilling or compaction.

C. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

3.3 INSTALLATION – PIPE

A. Install type of pipe shown on the drawings. Installation provisions herein shall apply to the extent as applicable to the pipe and joints allowed.

B. Inspect pipe for defects and cracks before being lowered into the trench, piece by piece. Remove and replace defective, damaged or unsound pipe or pipe that has had its grade disturbed after laying. Protect open ends with a stopper to prevent earth or other material from entering the pipe during construction. Remove dirt, excess water, and other foreign materials from the interior of the pipe during the pipe laying progress.

C. Excavate pipe trench and place bedding material in accordance with Section 312000.

D. Install pipe in accordance with manufacturer’s written recommendations.

E. HDPE Pipe: Install pipe in accordance with pipe manufacturer's installation Guidelines for Culvert Storm Drainage Applications and as indicated on the drawings.

F. Commence installation at the lowest point for each segment of the route. Lay RCP with the groove or bell end upstream. Place riveted CSP with the inside circumferential

laps pointing downstream. Repair damaged bituminous coating on CSP by applying bituminous material conforming to AASHTO M190.

G. Lay pipe to the required line and slope gradients with the necessary fittings, bends, manhole, risers and other appurtenances placed at the required location as noted on Drawings.

H. Do not displace or damage pipe when compacting.

I. Do not place pipe in water or when trench conditions are unsuitable for such work.

J. Joints:
Construct joints as described herein and in accordance with manufacturer's installation instructions. Provide pipe joint type for silttight joint performance in accordance with the following table. The table applies only to the extent as applicable to the pipe and joint type and the joint performance as shown or specified.

Pipe and Joint Type	Joint Performance		
	Watertight	Silttight	Soiltight
RCP			
Rubber O-Ring Gasket	x	x	x
Bitumen or Butyl Rubber Sealant			x
DIP			
Rubber Gasket	x	x	x
HDPE			
Rubber Gasket			
Hancor BLUE SEAL	x	x	x
ADS N-12 WT	x	x	x
Hancor Sure-Lok		x	x
ADS N-12 ST		x	x
Corrugated Coupling Bands			
Hancor Hi-Q			x
ADS N-12			x
PE Wrap			x
PVC			
Restrained Gasket	x	x	x
CMP or Spiral Rib Aluminum Pipe			
Hugger Band w/ O Ring Rubber Gasket		x	x
Hugger Band			x

3.4 INSTALLATION – MANHOLES, CATCH BASINS, INLETS, AND JUNCTION BOXES

A. Construct drainage structures in accordance with details shown on Drawings and in accordance with Section 334913 as applicable.

B. Precast Sections:

1. Install precast section with bases in accordance with Section 312000 and 334913 or as shown on drawings.
2. Align pipe openings to that of the pipe entering and leaving the manhole, etc. Properly Pipe with connections to manholes, etc. as shown on the drawings.

C. Construct Cast-In-Place sections as shown on the drawings.
1. Form bottom of excavation clean and smooth to correct elevation.
2. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe to be placed at proper elevation.
3. Form and place cast-in-place concrete walls, sleeved at proper elevation to receive storm sewer pipe in accordance with details shown on Drawings.

D. Invert channels shall be smooth and accurately shaped to a semicircular bottom conforming to the inside of the adjacent sewer section. Shape invert channels and structure bottoms with cement mortar. Changes in size and grade of invert shall be made gradually and evenly. Changes in direction of the sewer entering branch or branches shall have a true curve of as large a radius as the manhole will permit.

E. Frames and Covers:
1. Set frames and covers to the proper elevation. Firmly embed frames in mortar approximately 1 inch thick and align to fit the top section of the structure.
2. Limit bricks set in mortar and used to adjust the frame to finished grade to no more than four courses.
3. Adjustment rings used to make adjustments in grade shall be made with the initial ring embedded in mortar and the exterior of the rings parged with mortar not less than 1/2 inch thick. No adjustment made in this manner shall exceed 8 inches.

F. Construct concrete cradles as shown on the drawings and as needed when crossing over and under sewer pipe or utility lines. Concrete shall be 3000 psi mix with a minimum thickness of 6 inches.

3.5 SUBDRAINS

A. Install subdrains in accordance with the details and at the locations shown on the drawings.

3.6 INSPECTION AND TESTING

A. General:
1. Clean, inspect, and test Strom sewer systems and culverts, upon completion or at such time as directed. The system or culvert shall have a true grade and line. Actual elevations shall be within 0.08 feet of the elevations given on the drawings.
2. After completion of the Work, or any part thereof, the job shall be tested to determine that it has been installed in accordance with the drawings and specifications. In general, the Work shall prove to be in good condition, installed in accordance with the drawings and specifications and ready for use.

B. Cleaning and Testing:
   1. Visibly inspect and remove all debris and obstructions from storm pipe.
   2. Test for infiltration and exfiltration by hydrostatic testing per ASTM C 969. Manholes and pipe shall conform to ASTM C 969 leakage criteria.

C. Alignment Test: After backfill has been placed and compacted to a depth not less than one foot above top of pipe, a visual inspection shall be made by flashing a light between manholes. Correct displacement or misalignment of invert.

END OF SECTION 334000

SECTION 33 4100 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 Specification Sections, and Section 550.01 through 550.07 of the Standard Specifications for Road and Bridge Construction apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Pipe and fittings.
   2. Nonpressure transition couplings.
   3. Expansion joints and deflection fittings.
   4. Cleanouts.
   5. Encasement for piping.
   6. Manholes.
   7. Stormwater inlets.
   8. Stormwater detention structures.
   9. Pipe outlets.

1.3 ACTION SUBMITTALS

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

B. Shop Drawings:
   1. Manholes: Include plans, elevations, sections, details, frames, and covers.
   2. Stormwater inlets: Include plans, elevations, sections, details, frames, covers, and grates.
   3. Yard Drains: Include plans, elevations, sections, details, frames, covers and connections.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.

B. Field quality-control reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect pipe, pipe fittings, and seals from dirt and damage.

B. Handle manholes, inlets, and castings according to manufacturer's written rigging instructions.

PART 2 - PRODUCTS

2.1 ABS PIPE AND FITTINGS

A. ABS Sewer Pipe and Fittings: ASTM D 2751, with bell-and-spigot ends for gasketed joints.
   1. NPS 3 to NPS 6: SDR 35.
   2. NPS 8 to NPS 12: SDR 42.

B. Gaskets: ASTM F 477, elastomeric seals.

2.2 PVC PIPE AND FITTINGS

A. PVC Profile Sewer Piping:
   1. Pipe: ASTM F 794, PVC profile, gravity sewer pipe with bell-and-spigot ends for gasketed joints.
   2. Fittings: ASTM D 3034, PVC with bell ends.
   3. Gaskets: ASTM F 477, elastomeric seals.

B. PVC Type PSM Sewer Piping:
   1. Pipe: ASTM D 3034, SDR 35 PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
   2. Fittings: ASTM D 3034, PVC with bell ends.
   3. Gaskets: ASTM F 477, elastomeric seals.

2.3 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76.
   1. Bell-and-spigot ends and gasketed joints with ASTM C 443, rubber gaskets or sealant joints with ASTM C 990, bitumen or butyl-rubber sealant
   2. Reinforced concrete storm sewer pipe class shall be determined by the bury depth given in Section 550 of the Standard Specifications for Road and Bridge Construction.

2.4 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
   1. For Concrete Pipes: ASTM C 443, rubber.
   2. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
   3. For Fiberglass Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   4. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   5. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:
   1. Manufacturers: Subject to compliance with requirements.
   2. Basis-of-Design Product: Subject to compliance with requirements, provide a watertight connection to dissimilar pipe wherever encountered.
      a. Dallas Specialty & Mfg. Co.
      b. Fernco Inc.
      c. Logan Clay Pipe.
      d. Mission Rubber Company; a division of MCP Industries, Inc.
      e. NDS Inc.
      f. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

2.5 CLEANOUTS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following] available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide synthetic turf drainage cleanouts or comparable product by one of the following:
   a. Canplas LLC.
   b. IPS Corporation.
   c. NDS Inc.
   d. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
   e. Sioux Chief Manufacturing Company, Inc.
   f. Zurn Light Commercial Products Operation; Zurn Plumbing Products Group.
   g. Equal approved by the owner
3. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.6 ENCASEMENT FOR PIPING

A. Where IEPA clearance requirements cannot be met, either the Water Main or the storm sewer must be encased or the storm sewer must be made water main quality. Encasement shall consist of a larger diameter water main quality pipe sealed at both ends which extends 10 feet on both sides of the conflict. C 900 PVC pipe is an acceptable encasement product.

2.7 MANHOLES

A. Standard Precast Concrete Manholes:
   1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
   2. Diameter: 48 inches minimum unless otherwise indicated.
   3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.

4. Riser Sections: 6-inch minimum thickness and lengths to provide depth indicated.
5. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
6. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
7. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
8. Steps:In accordance with IDOT Standard Drawing 602701 placed as shown on the Detail Drawing for Manholes.
9. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Designed Precast Concrete Manholes:
1. Description: ASTM C 913; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
2. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
3. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
4. Steps: In accordance with IDOT Standard Drawing 602701 placed as shown on the Detail Drawing for Manholes.
5. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
6. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope.

2.8 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:
1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.
5. Portland cement design mix (IDOT Class DS Mix), 4500 psi minimum

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.

2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
2. Benches: Concrete, sloped to drain into channel.
a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix (IDOT Class DS Mix), 4500 psi minimum, with 0.58 maximum water/cementitious materials ratio.
1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.9 STORMWATER INLETS

A. Gutter Inlets: Made with horizontal gutter opening made of precast concrete with 6” walls and precast bottom include heavy-duty frames and grates. The Contractor shall pour a sloped invert when the inlet box is set an pipes are set and grouted.

B. Frames and Grates: Heavy duty Neenah No. R-3246 or approved Equal.

2.10 PIPE OUTLETS

A. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control." Riprap shall follow Section 281.01 through 281.03 of the Standard Specifications for Road and Bridge Construction.

B. Filter Stone: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.

C. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 Grading.

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow, nonpressure drainage piping according to the following:
   1. Install piping pitched down in direction of flow.
   2. Install ABS sewer piping according to ASTM D 2321 and ASTM F 1668.
   3. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
   4. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:
   1. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
   2. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
   3. Join ABS sewer piping according to ASTM D 2321 and ASTM D 2751 for elastomeric-seal joints.
   4. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
   5. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
   6. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
   7. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
   8. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. PVC Schedule 40 pipe fittings in sewer pipes at branches for cleanouts and PVC Schedule 40 for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
   1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
   2. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic areas.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 12 inches by 12 inches by 4 inches deep. Set with tops above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.5 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 1 inch above finished ground surface except open grate tops which are constructed as area drains, unless otherwise indicated.

3.6 STORMWATER INLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Install outlets that spill onto grade, anchored with concrete, where indicated.

C. Set Curb Inlets in accordance with the details shown. Inlet frames shall be set to grade and the curb poured to the top of frame. Curb inlets are to be isolated from settlement and frost action on the adjacent curb with dowelled expansion joints.

3.7 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."

B. Make connections to existing piping and underground manholes.

1. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
2. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

C. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
    1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
        a. Unshielded flexible couplings for same or minor difference OD pipes.
        b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.

3.8 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
    1. Submit separate reports for each system inspection.
    2. Defects requiring correction include the following:
        a. Alignment: Less than full diameter of inside of pipe is visible between structures.
        b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
        c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
        d. Infiltration: Water leakage into piping.
        e. Exfiltration: Water leakage from or around piping.
    3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
    4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, and the following:
    a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
    b. Option: Test plastic piping according to ASTM F 1417.
    c. Option: Test concrete piping according to ASTM C 924.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.9 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION 33 4100

SECTION 334913 - SEWER MANHOLES, FRAMES, AND COVERS

PART 1 - GENERAL

1.1 SUMMARY

1.2 Section Includes:

1. Monolithic concrete, modular precast concrete, masonry, and precast polyethylene manhole assemblies.

1.3 Related Requirements:

1. Section 312000 - Grading
2. Section 334000 - Storm Drainage
3. Rock River Water Reclamation District Specifications

1.4 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. ASTM International (ASTM):

1. ASTM A48 - Gray Iron Castings.
2. ASTM C55 - Concrete Building Brick.
3. ASTM C94 - Ready Mixed Concrete.
4. ASTM C478 - Precast Reinforced Concrete Manhole Sections.
5. ASTM C990 - Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
6. ASTM D1248 - Polyethylene Plastics Molding and Extrusion Materials.
7. ASTM D2412 - Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

C. International Masonry Industry All-Weather Council (IMIAC):

1. Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

D. State Department of Transportation (DOT), Construction and Material Specifications.

1.5 SUBMITTALS

A. Shop Drawings: Indicate reference to Construction Drawings of manhole locations, elevations, piping with sizes, locations, and elevations of penetrations.

PART 2 - PRODUCTS

2.1 MANHOLES

A. Cast-In-Place Concrete: Nonreinforced cast in place concrete barrel.

1. Concrete 3500 psi concrete conforming to ASTM C94.

2. Forms: Steel sheet accurately shaped and fabricated of sufficient strength to form dense watertight walls to true dimensions.

B. Precast Concrete: Reinforced precast concrete barrel.
   1. Manhole Sections: ASTM C478.
   2. Joints and Joint Sealant: Joint between manhole barrel sections shall conform to ASTM C990 using preformed flexible joint sealant.
   3. Pipe Connection Sealant: Joint material between manhole barrel and adjoining pipe shall be as shown on the drawings.
   4. Construct manholes of precast concrete sections as required by Construction Drawings to size, shape, and depth indicated.

C. Concrete Brick: ASTM C55, Grade N Type I-moisture controlled, normal weight, of same grade, type and weight as block units, nominal modular size of 3 5/8-inches x 7 5/8-inches x 2 1/4-inches.

D. Precast Polyethylene:
   1. Manufacturer: Advanced Drainage Systems (ADS) or approved equal.
   2. Precast polyethylene in accordance with ASTM D1248. Nominal cylinder internal diameter shall be 48-inches and shall be designed to accept concrete filled polyethylene manhole lids and standard cast iron frames with lid or grate.
   3. Manholes shall have compressive strength that meets ASTM D2412 standards.

E. Mortar and Grout: Mortar for finishing and sealing shall be Class "C". Honeycombing less than 2-inches deep shall be repaired using Class "D" mortar.

F. Brick Transition Reinforcement: Formed steel 8-gauge wire with galvanized finish.

G. Configuration:
   1. Barrel Construction: Concentric with eccentric cone top section.
   2. Shape: Cylindrical.
   3. Clear Inside Dimensions: 48-inches diameter minimum or as indicated on Construction Drawings.
   4. Design Depth: As indicated on Construction Drawings.
   5. Clear Lid Opening: 22-inches minimum.
   6. Pipe Entry: Provide openings as indicated on Construction Drawings.
   7. Main and Lateral Pipes: Neatly cut off main and lateral pipes flush with inside of manhole or inlet where they enter structure walls. Point up irregularities and rough edges with nonshrinking grout.

H. Inverts: Shape inverts for smooth flow across structure floor as indicated on Construction Drawings. Use concrete and mortar to obtain proper grade and contour. Finish surface with fine textured wood float.

2.2 COMPONENTS

A. Lid and Frame:
   1. Manufacturer: One of the following or approved equal:
      a. Bass & Hays Foundry.

b. Deeter Foundry, Inc.
c. East Jordan Iron Works.
d. Neenah Foundry.
e. U.S. Foundry & Manufacturing

2. ASTM A48, Class 30B minimum, heavy duty cast iron construction, machined flat bearing surface.
3. Removable lid, closed or open as indicated on Construction Drawings, with sealing gasket.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify items specified by other Sections are properly sized and located.

B. Verify that built-in items are in proper location and ready for roughing into work.

C. Verify that the excavation for manholes is correct.

3.2 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves as indicated on Construction Drawings.

3.3 PRECAST MANHOLE CONSTRUCTION

A. Place base pad to proper elevation and location and trowel top surface level for placement of manhole barrel.

B. Place manhole barrel plumb and level to correct elevations and anchor to base pad.
1. After completion of slab foundation, lower first joint of manhole barrel into position, grooved end first, and set level and plumb on concrete base. Align and adjust to proper grade prior to placing and forming invert. Pour invert immediately after setting of first section of manhole barrel.
2. Prior to setting subsequent manhole barrel sections, apply primer to tongue and groove ends and allow to set in accordance with manufacturer's recommendations. Place joint sealant on tongue end. Lower next section into position, and remove excess material from interior of structure. Add additional material on exterior of joint, if necessary, for completely watertight joint.

C. Set cover frames and lids level without tipping, to correct elevations. Utilize pre-cast rings or brick and mortar to achieve final rim elevation. Maximum limit, 4 courses.

3.4 CAST-IN-PLACE MANHOLE CONSTRUCTION

A. Cast-in-place concrete shall conform to the applicable requirements of concrete in Division 3. Utilize steel forms.

B. Place base pad to proper elevation and location and pour monolithically with invert. Base shall support pipe to first joint.

C. Deposit concrete in evenly distributed layers of about 18 inches, with each layer vibrated to bond to preceding layer.

D. Place gasket between all joints and paint exterior of manhole within 5 inches of the joint with mastic waterproofing.

E. Place precast concrete cone.

F. Set section cover frames and lids level without tipping, to correct elevations. Utilize pre-cast rings or brick and mortar to achieve final rim elevation. Maximum limit, 4 courses.

3.5 MASONRY MANHOLE CONSTRUCTION

A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

B. Lay masonry units in running bond. Course 3 brick units and 3 mortar joints to equal 8 inches.

C. Form flush mortar joints

D. Lay masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

E. Install joint reinforcement 16 inches on center

F. Place joint reinforcement in first and second horizontal joints above base pad and below lid frame opening

G. As work progresses, build in fabricated metal items

H. Cut and fit masonry for pipes as specified herein

I. Set cover frames and covers level to correct elevations without tipping.

END OF SECTION 334913