RFP Request for Proposals

General Contracting Services
COMMUNITY CENTER PARKING LOT

FOR

Sidock Group, Inc.

ENGINEERS • ARCHITECTS • CONSULTANTS • PROJECT MANAGERS

TABLE OF CONTENTS/SPECIFICATIONS

DIVISION 0 - FRONT-END DOCUMENTS

DIVISION 1 - GENERAL REQUIREMENTS

CIVIL ENGINEERING SPECIFICATIONS

END OF SECTION 02

Charter Township of Brownstown

Request for Proposals for General Contracting Services – Community Center Parking Lot

Brownstown Township is soliciting sealed proposals to provide General Contracting Services for construction of a new parking lot and associated infrastructure for the Charter Township of Brownstown. By responding to this RFP, the respondent agrees to perform in accordance with the terms and conditions set forth herein.

Date Issued:	06-01-2026
Mandatory Pre-Bid Site Meeting	06-08-2026 / Monday, June 8th, 2026 @ 10:00AM Location: Brownstown Community Center Parking Lot (the project site) 21311 Telegraph Rd. Brownstown, MI 48183
Proposal Question Deadline:	06-17-2026 @ 12:00PM
Proposal Deadline:	06-24-2026 / Wednesday, June 24th 2026 @ 1:00PM ***Via Electronic Submission*** www.bidnetdirect.com/mitn/chartertownshipofbrownstown Brownstown Township 21313 Telegraph Rd Brownstown, MI 48183

Section 1 - NOTICE

Brownstown Township is accepting sealed proposals from experienced and qualified General Contractors for construction of a new parking lot and associated infrastructure for the Charter Township of Brownstown. Detailed requirements are listed within this document.

Proposals will be accepted **via electronic proposal submission ONLY** by the Charter Township of Brownstown, 21313 Telegraph Rd, Brownstown, MI 48183 until **EXACTLY 1:00 PM LOCAL TIME, 06-24-2026** at which time the names and addresses ONLY of submitting proposers will be opened and responding General Contractors names read aloud in the Township Board Room at Brownstown Township Hall, 21313 Telegraph Rd, Brownstown, MI 48183.

PROPOSAL NAME:	General Contracting Services – Community Center Parking Lot
DUE DATE/TIME AND BID OPENING:	06-24-2026 @ 1:00PM
MAIL OR DELIVER TO:	ELECTRONIC SUBMISSION ONLY via Michigan Intergovernmental Trade Network (MITN) https://www.bidnetdirect.com/mitn/chartertownshipofbrownstown

Brownstown Township reserves the right to reject any and all proposals and to waive any informality in proposals received, deemed to be in the best interest of the Township.

Section 2 - INSTRUCTIONS

PROPOSAL FORMAT

All proposals must be submitted electronically via the Michigan Intergovernmental Trade Network (MITN) website. Hardcopy, Faxed or Emailed proposals will not be accepted. The Charter Township of Brownstown is capable of accepting documents in docx, xlsx, pdf, jpg, tif or rtf formats. It is requested that you upload one complete document, versus that of several individual sheets. Please name your files accordingly if more than one file is uploaded.

The submission of a proposal hereunder shall be considered evidence that the vendor is satisfied with respect to the conditions to be encountered and the character, quantity and quality of work to be performed.

Proposals shall be submitted in the format outlined in the "Proposal Requirements" section of this document in order to be deemed responsive. Any deviation from the specifications must be noted in the Proposal.

Michigan Intergovernmental Trade Network

The Charter Township of Brownstown officially distributes bid/proposal documents through the Michigan Intergovernmental Trade Network (MITN). Copies of proposal documents obtained from any other source are not considered official copies. Only those vendors who obtain proposal documents from the MITN System are guaranteed access to receive addendum information, if such information is issued.

To begin, visit: www.bidnetdirect.com/mitn, and use the "Vendor Registration" link and complete your online registration. If you are already registered as a Vendor on this system with another local agency, you do not need to register again. There is no cost for you to register and retrieve bid documents from the MITN Purchasing Group.

After registering, you can view bid opportunities from Brownstown Township at:
www.bidnetdirect.com/mitn/chartertownshipofbrownstown

It is important that you read all the information to ensure you submit your bid response to the Township in the correct manner. Please ensure all documents are signed. If you are interested in providing a bid, please read the document in its entirety and submit the requested information and proper forms and upload to the MITN website. **Electronic submission ONLY will be accepted. Hardcopy, emailed, faxed and late submittals will not be accepted.**

Final proposal results will be posted on the MITN website after award.

All prospective consultants shall be responsible for routinely checking MITN for addenda, additional documents, or other relevant information. Brownstown Township shall not be responsible for the failure of a prospective consultant to obtain addenda and other information issued at any time related to this RFP.

Section 3 - General Conditions

1. ***COMMUNICATIONS*** - All correspondence from interested firms regarding this proposal must be directed to the attention of Sue Trussell, Director, Brownstown DDA, 21313 Telegraph Rd, Brownstown, MI 48183, phone: 734-675-5911, and STrussell@brownstown-mi.org . Email is the required method of contact. No contact regarding this solicitation made with other Township employees is permitted. Any violation of this condition may result in immediate rejection of the proposal. Inquiries received after 12:00 PM on WEDNESDAY, June 17, 2026, will not be considered.

2. ***LATE PROPOSALS*** – Proposals must be received electronically via MITN prior to the specified time and date proposals are due. Proposals received after the submission deadline shall be rejected as non-responsive proposals.

3. ***WITHDRAWL OF PROPOSALS*** - Proposals may NOT be withdrawn after they have been deposited with the Charter Township of Brownstown, except as provided by law.

4. All costs incurred in the preparation, submission, and presentation of this proposal, in any way whatsoever, will be wholly absorbed by the prospective firm. All supporting documentation will become the property of the Charter Township of Brownstown unless requested otherwise at the time of submission. Michigan FOIA requires the disclosure, upon request, of all public records that are not exempt from disclosure under section 13 of the Act, which are subject to disclosure under the Act. Therefore, confidentiality of information submitted in response to this Request for Proposals is not assured.

5. Project assignments will be on an as-needed basis. The Township reserves the right to perform work in-house or to assign specific projects on a separate competitive or negotiated basis to a different selected firm or to other firms currently working on existing Township projects and under contract.

6. To assist the selected firm, the Township will provide the firm copies of all current Codes, maps, aerials, previous meeting minutes and historical codes as available, appropriate and as legally possible, in possession of the Township relevant to the nature of the work assignments.

7. The Township reserves the right to reject any and all proposals, to waive any informality in the proposal received, and to accept any proposal (or part thereof) which it will deem to be most favorable to the interests of the Township or to award to multiple proposers.

8. The Township reserves the right and opportunity to request the firm to provide professional services for other activities that include, but are not limited to, code analysis, special studies and representation at regional meetings, if Township personnel are not available. The work may be for areas not specifically identified in this Request for

Proposals, but will be closely associated. As an example: if the firm provides professional services in areas of Engineering, Landscape Architecture, etc., the Township may use this contract to secure those services.

9. The Township reserves the right to modify the scope of services during the course of the contract. Such modification may include adding or deleting any tasks this scope of services will encompass and/or any other modifications deemed necessary. Any changes in pricing or payment terms proposed by the consultant resulting from the requested changes are subject to acceptance by the Township. Changes may be increases or decreases.

10. The successful proposer must furnish documentation complying with State of Michigan and Federal laws relating to discrimination under Equal Employment Opportunity (EEO).

11. The Charter Township of Brownstown is exempt from all sales, excise, and transportation taxes.

12. The selected firm must maintain for the life of the agreement insurance coverage meeting the minimum limits of liabilities as outlined in "Section 6 – Proposal Requirements" in this document.

13. Ownership of all data, materials and documentation originated and prepared for the Charter Township of Brownstown pursuant to the Request for Proposals and the subsequent contract shall belong exclusively to the Charter Township of Brownstown.

14. The consultant will provide competent, suitable and qualified personnel to perform the work as required by the specifications. The consultant will designate a representative who will be the point of contact and will have the authority to act on behalf of the consultant. The consultant's representative will not be replaced without prior written notice to the Township. All communications given the consultant's representative will be as binding as if given to the consultant.

15. The consultant shall not subcontract any or all portions of the work unless the Township grants prior written approval. Any subcontractor, so approved, shall be bound by the terms and conditions of this contract. The consultant shall be fully liable for all acts and omissions of its subcontractor(s) and shall indemnify the Charter Township of Brownstown for such acts or omissions.

16. All work shall meet with the approval of the Township Manager, as conforming to the provisions and requirements of this contract.

17. Advanced payments will not be authorized. Payments will be made on a time and materials basis and acceptance of services rendered. Invoices acceptable to the Township will be paid net 30 days, following the Charter Township of Brownstown's schedule for payment of invoices.

18. The Charter Township of Brownstown reserves the rights to waive any informalities, or immaterial omissions or defects not involving price, time or changes in the work and to reject any or all proposals, if to do so is deemed in the best interest of the Township. In no event will an award be made until all necessary investigations are made as to the responsibility and qualifications of the consultant to whom it is proposed to make such award. Any contract awarded to a person or company who is discovered to have been in default or disqualified at the time of the awarding of the contract shall be voidable at the discretion of the Township Manager of the Charter Township of Brownstown.

19. In the event bankruptcy proceedings are commenced by or against contractor or under any provisions of the United States Bankruptcy Act or for the appointment of a receiver or trustee or a general assignment for the benefit creditors of either party. The Township shall be entitled to terminate without further cost or liability. The Township may cancel the Agreement/Contract or affirm the Contract and hold the contractor responsible for damages.

20. As this Request for Proposals is being made available by electronic means, the proposer accepts full responsibility to ensure that no changes are made to the Request for Proposals documents. In the event of conflict between a version of the Request for Proposals submitted by proposer and the version maintained by the Charter Township of Brownstown, the version maintained by the Charter Township of Brownstown shall govern.

21. It shall be the proposer's responsibility to make inquiry as to the changes or addenda issued. Addendum will be posted on the MITN system. All such changes or addenda shall become a part of the contract and all contractors shall be bound by such changes or addenda.

22. ***Professional Approach*** - The firm will represent that all tasks will be performed in accordance with generally acceptable professional standards and further represent that the advice and consultation provided will be within its authority and capacity as a professional. The firm will comply with the regulations, laws, ordinances and requirements of all levels of government applicable to this scope of services.

Section 4 - Minimum Qualifications and Mandatory Requirements

These guidelines are provided to assist firms submitting in response to this Request for Proposal in formulating a thorough response. The successful firm ensures and understands that:

1. The awarded contractor will have a minimum of ten (10) years of experience providing this type of service in a commercial environment.

2. The awarded contractor shall ensure that they will work closely with Township staff during all phases of the work.

3. All licenses required by the State of Michigan are to be maintained by the contractor during the course of the contract.

4. All required insurances are to be maintained by the contractor during the course of the contract.

5. The contractor will provide a single point of contact for the duration of the contract.

6. The contractor will ensure provision of services in accordance with proposed timelines.

7. The contractor will comply with administrative procedures of the Township.

8. The contractor will meet with applicable Township departments to review specific concerns or issues.

Section 5 - Scope of Work

Overview

The Charter Township of Brownstown, Michigan located in southern Wayne County in Southeastern Michigan, is pursuing General Contracting services for the construction of a new parking lot including associated landscaping, lighting, and infrastructure.

The contractor will furnish all required labor, materials, supplies, management and travel required in connection with the scope of services. The Township expects that the contractor's staff will include individuals with expertise in the associated type of work.

Required Services

The anticipated services provided by the General Contractor shall include, but not be limited to, the following:

1. Site clearing and site preparation construction services as required per the construction documents and specifications.

2. Underground utility removal and installation construction services as required per the construction documents and specifications.

3. Electrical removal and installation construction services as required per the construction documents and specifications.

4. Paving removal and installation construction services as required per the construction documents and specifications.

5. Landscaping removal and installation services as required per the construction documents and specifications.

6. Conduct bi-weekly on-site progress meetings with the Owner's representative and Civil Engineer of record.

7. Schedule and meet requirements of all mandatory third-party reviews, testing, and inspections per local authorities.

Section 6 - Proposal Requirements

1. **SIGNATURE PAGE**

   Complete and include the Signature Page located in Section 9 of this RFP.

2. **COVER LETTER**

   Please submit a cover letter that shall be signed by a member of the Company that is empowered to commit the company to a contractual arrangement with the Township. The cover letter shall also identify the person who will be responsible for regular communications with the Township, including meeting attendance.

3. CORPORATE BACKGROUND

Please provide information on the company's background, which includes the following information:

a. Organization, size and Michigan office locations
b. A description of the range of services provided by your company.

4. PROFESSIONAL STAFF

Please identify the individual(s) who would be providing services to the Township. List their experience in providing related services to municipalities of similar size and character, define the roles of each staff person as it relates to the services to be provided to Brownstown Township.

5. CAPACITY

Please describe the company's capability to provide the proposed scope of services with its present work force. Firms should clearly identify all disciplines available within the firm and those that will be subcontracted to others. List any subcontracted firms, if applicable.

6. EXPERIENCE AND REFERENCES

Please provide descriptions of recent prior experience with similar communities within the last five (5) years. For each project, include the name, title and telephone number of a representative that the Township may contact to discuss your experience.

7. FEES

Fees to be listed as requested within the bid form attached to this RFP.

8. INSURANCE

Provide evidence of general liability, automobile liability, and professional liability in an amount of at least $1,000,000 combined single limit, as well as Workers compensation Insurance with the statutory overages. Also provide proof of professional liability insurance (errors and omissions).

9. DISCLOSURE

Brownstown Township requires that the general contractor identify any potential conflicts of interests and how the Consultant plans to handle these matters.

10. OMISSION OF SERVICES

If a respondent believes that some of the services being requested are not necessary, please identify those services and reasons for their omission.

Section 7 - REVIEW, EVALUATION, AND SELECTION PROCESS

Selection of a General Contractor's construction services will be made at the complete discretion of the Township Board of Brownstown Township, which reserves the right to accept or reject any and all proposals.

It is the intent of Brownstown Township to select a General Contractor in accordance with the schedule outlined in Section 8 of this document.

Proposals will first be reviewed by a Proposal Review Committee of Township Officials who will determine which General Contractors will be invited to participate in an interview with the committee.

The Charter Township of Brownstown reserves the right to interview any number of qualifying bidders as part of the evaluation process. The decision as to which bidder to contact (if any) will be based upon the most qualified, capable, cost effective, and experienced bidder(s) determined in the evaluation process.

The Charter Township of Brownstown reserves the right to reject any and all proposals or to make an award based directly on the proposals, or to negotiate further with one or more companies. Subsequent negotiations may be conducted, but such negotiations will not constitute acceptance, rejection or a counter-offer on the part of the Township. The company(s) selected for the award will be chosen on the basis of the apparent greatest benefit to the Charter Township of Brownstown, including but not limited to:

1. Experience and Qualifications.
2. Capacity to perform scope of services
3. Comparable Assignments and Projects
4. Responsiveness to Required Services
5. Cost Proposal

Once a company is selected, the selected General Contractor shall be notified shortly thereafter. The Charter Township of Brownstown reserves the right to negotiate a final contract (pending Township Board approval).

The selected General Contractor shall be expected to provide Brownstown Township with services as soon as the contract can be ratified.

SIGNATURE PAGE

The undersigned hereby declares that he/she:

1. Is duly authorized to make binding offers on behalf of the company.
2. Has carefully examined and understands all information, terms and conditions in the RFP.
3. Certifies that the bid proposal documents contained herein were obtained directly from the MITN website, www.bidnetdirect.com/mitn/chartertownshipofbrownstown, and is an official copy of the Authorized Version.
4. Has not engaged in any collusive actions with any other potential consultants for this RFP.
5. It is understood that all proposed prices shall remain in effect for at least ninety (90) days from the date of the proposal opening to allow for the award and that, if chosen the successful vendor, the prices will remain firm through invoice.
6. Hereby offers to enter into a binding contract with Brownstown Township for the products and services herein offered, if selected by Brownstown Township within 90 days from proposal due date.
7. Proposers shall identify any interests, and the individuals involved, on separate paper with the response and shall understand that the Township, at its discretion may reject their proposal.

Name: _____

Title: _____

Signature of Authorized Company Representative: _____

Dated: _____

Contact Person of company representative for matters regarding this RFP:

_____
NAME

_____
TITLE

_____
E-MAIL

_____
PHONE

_____
MAILING ADDRESS CITY STATE ZIP CODE

L I S T O F D R A W I N G S

COMMUNITY CENTER RENOVATION AND ADDITION

CIVIL

CE1 HENNESSEY ENGINEERS - COVER SHEET / SHEET INDEX / PROJECT LOCATION
CE2 NOTES & DETAILS
CE3 EXISTING CONDITIONS & REMOVALS
CE4 SITE PLAN
CE5 GRADING PLAN
CE6 STORM SEWER PLAN & PROFILES
CE7 STORM SEWER CACULATIONS
CE8 WATERMAIN PLAN & PROFILE
CE9 SESC PLAN
CE10 FIRE TRUCK TURNING PLAN
CE11 AERIAL OVERLAY
L-100 LANDSCAPE PLAN
L-101 LANDSCAPE PLAN

ELECTRICAL

ES-100 ELECTRICAL SITE PLAN
ES-101 ELECTRICAL SITE PHOTOMETRIC PLAN
ES-600 ELECTRICAL SITE LIGHTING FIXTURE SCHEDULE & DETAILS
ES-601 ELECTRICAL SITE PANEL SCHEDULES

BROWNSTOWN TWP STANDARD DETAILS

MD-1 MISC. DETAILS
ST-1 STORM SEWER DETAILS
SE-1 SESC DETAILS
WM-1 WATERMAIN DETAILS
WM-2 WATERMAIN DETAILS
SS-1 SANITARY SEWER DETAILS

SECTION 004113 - BID FORM

1.1 BID INFORMATION

A. Bidder: _____.

B. Project Name: Brownstown Charter Township Community Center Parking Lot.

C. Project Location: Brownstown, Michigan.

D. Owner: Brownstown Charter Township.

E. Architect/Civil Engineer: Sidock Group, Inc. / Hennessey Engineers

F. Architect Project Number: 25342.

1.2 CERTIFICATIONS AND BASE BID

A. Base Bid, Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by Sidock Group, Inc. and Hennessey Engineers, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:

_____ Dollars

($_____).

1.3 BID GUARANTEE

A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 10 days after a written Notice of Award, if offered within 90 days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached cash, cashier's check, certified check, U.S. money order, or bid bond, as liquidated damages for such failure, in the following amount constituting five percent (5%) of the Base Bid amount above:

_____ Dollars

($_____).

B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return the bid guarantee to the undersigned.

1.4 ITEMIZED BID BREAKDOWN

A. The undersigned Bidder hereby submits the following cost breakdown by Division. These values shall be submitted for informational and bid comparison purposes. Upon notification of being one of the Low Bidders for further consideration, a formal Schedule of Values will be requested which will be used in part for the evaluation of Application for Contract Payments. General Contract bidders shall request that their proposed subcontractors itemize their respective bids to clearly illustrate the following Division of Bid:

ITEM	**COST BREAKDOWN**
1 General Requirements	$_____
2 Demolition	$_____
3 Utilities	$_____
4 Earthwork	$_____
5 Paving	$_____
6 Electrical	$_____
7 Landscaping	$_____
8 Irrigation	$_____
9 Signage	$_____
Subtotal	$_____

1.5 SUBCONTRACTORS AND SUPPLIERS

A. The following companies shall execute subcontracts for the portions of the Work indicated:

1 Paving Work: _____.
2 Plumbing Work: _____.
3 Electrical Work: _____.
4 Earth Work: _____.
5 Landscaping Work:_____.

1.6 TIME OF COMPLETION

A. The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a written Notice to Proceed to be issued by Architect and shall fully complete the Work within _____ calendar days.

1.7 ACKNOWLEDGEMENT OF ADDENDA

A. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:

1 Addendum No. 1, dated _____.
2 Addendum No. 2, dated _____.
3 Addendum No. 3, dated _____.
4 Addendum No. 4, dated _____.

1.8 CONTRACTOR'S LICENSE

A. The undersigned further states that it is a duly licensed contractor, for the type of work proposed, in the State of Michigan, and that all fees, permits, etc., pursuant to submitting this proposal have been paid in full.

SUBMISSION OF BID

A. Respectfully submitted this ____ day of _____, 2026.

B. Submitted By:_____(Name of bidding firm or corporation).

C. Authorized Signature:_____(Handwritten signature).

D. Signed By:_____(Type or print name).

E. Title:_____(Owner/Partner/President/Vice President).

F. Witness By:_____(Handwritten signature).

G. Attest:_____(Handwritten signature).

H. By:_____(Type or print name).

I. Title:_____(Corporate Secretary or Assistant Secretary).

J. Street Address:_____.

K. City, State, Zip:_____.

L. Phone:_____.

M. License No.:_____.

N. Federal ID No.:_____(Affix Corporate Seal Here).

END OF SECTION 004113

DOCUMENT 004313 - BID SECURITY FORMS

1.1 BID FORM SUPPLEMENT

A. A completed bid bond form is required to be attached to the Bid Form.

1.2 BID BOND FORM

A. AIA Document A310, "Bid Bond," is the recommended form for a bid bond. A bid bond acceptable to Owner, or other bid security as described in the Instructions to Bidders, is required to be attached to the Bid Form as a supplement.

B. Copies of AIA standard forms may be obtained from The American Institute of Architects; www.aia.org/contractdocs/purchase/index.htm; email: docspurchases@aia.org; (800) 942-7732.

END OF DOCUMENT 004313

SECTION 006000 - PROJECT FORMS

1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

A. The following form of Owner/Contractor Agreement and form of the General Conditions shall be used for Project:

1. AIA Document A101, "Standard Form of Agreement between Owner and Contractor, Stipulated Sum."

a. The General Conditions for Project are AIA Document A201, "General Conditions of the Contract for Construction."

1.2 ADMINISTRATIVE FORMS

A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.

B. Copies of AIA standard forms may be obtained from the American Institute of Architects; http://www.aia.org/contractdocs/purchase/index.htm; docspurchases@aia.org; (800) 942-7732.

C. Preconstruction Forms:

1. Form of Performance Bond and Labor and Material Bond: AIA Document A312, "Performance Bond and Payment Bond."
2. Form of Certificate of Insurance: AIA Document G715, "Supplemental Attachment for ACORD Certificate of Insurance 25-S."

D. Information and Modification Forms:

1. Change Order Form: AIA Document G701, "Change Order."
2. Form of Change Directive: AIA Document G714, "Construction Change Directive."

E. Payment Forms:

1. Schedule of Values Form: AIA Document G703, "Continuation Sheet."
2. Payment Application: AIA Document G702/703, "Application and Certificate for Payment and Continuation Sheet."
3. Form of Consent of Surety: AIA Document G707, "Consent of Surety to Final Payment."

END OF SECTION 006000

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:
1 Section 012100 "Allowances" for products selected under an allowance.
2 Section 012300 "Alternates" for products selected under an alternate.
3 Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
1 Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2 Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use facsimile of form provided in Project Manual.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
   a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
   b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
   c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
   d. Product Data, including drawings and descriptions of products and fabrication and

installation procedures.

e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
   a. Forms of Acceptance: Change Order or Architect's Supplemental Instructions for minor changes in the Work.
   b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce

indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
1 Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
2 Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
3 Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 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 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 days before the date scheduled for submittal of initial Applications for Payment.

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. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
4. 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.

5. 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.

6. Overhead Costs: Include total cost and proportionate share of general overhead and profit for each line item.

7. Schedule of Values Revisions: Revise the schedule of values when Change Orders result in a change in the Contract Sum. Include at least one separate line item for each Change Order.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

B. Payment Application Times: Submit Application for Payment to Architect by the fifteenth of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
1 Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2 Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3 Include amounts of Change Orders issued before last day of construction period covered by application.
4 Indicate separate amounts for work being carried out under Owner-requested project acceleration.

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 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. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 48 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

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 conditional final or full waivers.
3 Owner reserves the right to designate which entities involved in the Work must submit waivers.
4 Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5 Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

H. 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 not final).
4. Products list (preliminary if not final).
5. Submittal schedule (preliminary if not final).
6. List of Contractor's staff assignments.
7. List of Contractor's principal consultants.
8. Copies of building permits.
9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
10. Initial progress report.
11. Report of preconstruction conference.
12. Certificates of insurance and insurance policies, if not already provided.
13. Performance and payment bonds, if not already provided.
14. Data needed to acquire Owner's insurance, if not already provided.

I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1 Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2 This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but

not limited, to the 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 Consent of Surety to Final Payment.
5 Evidence that claims have been settled.
6 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.
7 Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1 General coordination procedures.
   2 Coordination drawings.
   3 RFIs.
   4 Digital project management procedures.
   5 Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:
   1 Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
   2 Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   3 Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

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, telephone number, and email address 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 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 in prominent location in built facility. Keep list current at all times.

1.5 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 that 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. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its own operations with operations included in different Sections that 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 with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3 Make adequate provisions to accommodate items scheduled for later installation.

C. 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.

D. 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.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of

products and materials fabricated or installed by more than one entity.

1 Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
   a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
   b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
   c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
   d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
   e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
   f. Indicate required installation sequences.
   g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

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, raised access floor, and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components 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 (32 mm) 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.

9 Review: Architect will review coordination drawings to confirm that in general 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 so inform Contractor, who shall make suitable modifications and resubmit.

10 Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1 File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
2 File Submittal Format: Submit or post coordination drawing files using PDF format.

1.7 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1 Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
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: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in 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 by Architect 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 Section 012600 "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 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 Software log with not less than 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.
   8 Identification of related Minor Change in the Work and Proposal Request, as appropriate.
   9 Identification of related Field Order and Proposal Request, as appropriate.

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.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
   1 Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
   2 Name file with submittal number or other unique identifier, including revision identifier.
   3 Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.9 PROJECT MEETINGS

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 dates and times a minimum of 10 working days prior to meeting.
2 Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3 Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. 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.
2. Agenda: Discuss items of significance that could affect progress, including the following:
   a. Responsibilities and personnel assignments.
   b. Tentative construction schedule.
   c. Phasing, if any.
   d. Critical work sequencing and long lead items.
   e. Designation of key personnel and their duties.
   f. Lines of communications.
   g. Use of web-based Project software.
   h. Procedures for processing field decisions and Change Orders.
   i. Procedures for RFIs.
   j. Procedures for testing and inspecting.
   k. Procedures for processing Applications for Payment.
   l. Distribution of the Contract Documents.
   m. Submittal procedures.
   n. Preparation of Record Documents.
   o. Use of the premises.
   p. Work restrictions.
   q. Working hours.
   r. Owner's occupancy requirements.
   s. Responsibility for temporary facilities and controls.
   t. Procedures for moisture and mold control.
   u. Procedures for disruptions and shutdowns.
   v. Construction waste management and recycling.
   w. Parking availability.
   x. Office, work, and storage areas.
   y. Equipment deliveries and priorities.
   z. First aid. aa. Security. bb. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility requirements.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 60 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
a. Preparation of Record Documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Procedures for completing and archiving web-based Project software site data files.
d. Submittal of written warranties.
e. Requirements for preparing operations and maintenance data.
f. Requirements for delivery of material samples, attic stock, and spare parts.
g. Requirements for demonstration and training.
h. Preparation of Contractor's punch list.

i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
j. Submittal procedures.
k. Coordination of separate contracts.
l. Owner's partial occupancy requirements.
m. Installation of Owner's furniture, fixtures, and equipment.
n. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at weekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. 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.
   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
   b. Review present and future needs of each entity present, including the following:

      1) Review schedule for next period.

      1) Interface requirements.
      2) Sequence of operations. 3) Resolution of BIM component conflicts. 4) Status of submittals. 5) Deliveries. 6) Off-site fabrication. 7) Access. 8) Site use. 9) Temporary facilities and controls. 10) Progress cleaning. 11) Quality and work standards. 12) Status of correction of deficient items. 13) Field observations. 14) Status of RFIs. 15) Status of Proposal Requests. 16) Pending changes. 17) Status of Change Orders. 18) Pending claims and disputes. 19) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100 SECTION

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1 Startup construction schedule.
2 Contractor's Construction Schedule.
3 Construction schedule updating reports.
4 Weekly construction reports.
5 Material location reports.
6 Site condition reports.
7 Unusual event reports.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1 Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2 Predecessor Activity: An activity that precedes another activity in the network.
3 Successor Activity: An activity that follows another activity in the network.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1 Working electronic copy of schedule file, where indicated.
2 Two paper copies, of sufficient size to display entire period or schedule, as required.

B. Startup construction schedule.

1. Submittal of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

D. Construction Schedule Updating Reports: Submit with Applications for Payment.

E. Daily Construction Reports: Submit at weekly intervals.

F. Material Location Reports: Submit at monthly intervals.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

H. Unusual Event Reports: Submit at time of unusual event.

1.5 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1 Secure time commitments for performing critical elements of the Work from entities involved.
2 Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

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

B. Time Frame: Extend schedule from date established for commencement of the Work 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.

C. Activities: Treat each floor 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 20 days, unless specifically allowed by Architect.
2 Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
3 Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
4 Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

D. 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. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
2 Products Ordered in Advance: Include a separate activity for each product. Delivery dates indicated stipulate the earliest possible delivery date.
3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date. Delivery dates indicated stipulate the earliest possible delivery date.
4. Work Restrictions: Show the effect of the following items on the schedule:
   a. Seasonal variations.
   b. 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. Fabrication.
e. Sample testing.
f. Deliveries.
g. Installation.
h. Tests and inspections.
i. Adjusting.
j. Curing.

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.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion**.**

F. 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.

1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.

G. 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 the Contract Time.

H. Contractor's Construction Schedule Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule at each regularly scheduled progress meeting.

1 Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2 Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3 As the Work progresses, indicate final completion percentage for each activity.

I. Recovery Schedule: When periodic update indicates the Work is 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, equipment required to achieve compliance, and date by which recovery will be accomplished.

J. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1 Post copies in Project meeting rooms and temporary field offices.
2 When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.7 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.8 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for commencement of the Work.
1. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.9 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. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events.
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.

13. Emergency procedures.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1 Material stored prior to previous report and remaining in storage.
2 Material stored prior to previous report and since removed from storage and installed.
3 Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

1. Submit unusual event reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1 Submittal schedule requirements.
   2 Administrative and procedural requirements for submittals.

B. Related Requirements:
   1 Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
   2 Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
   3 Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
   4 Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
   5 Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
   6 Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
   7 Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
   8 Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.4 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
   1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
   2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
   3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
      a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
   4. Format: Arrange the following information in a tabular format:
      a. Scheduled date for first submittal.
      b. Specification Section number and title.
      c. Submittal Category: Action; informational.
      d. Name of subcontractor.
      e. Description of the Work covered.
      f. Scheduled date for Architect's final release or approval.
      g. Scheduled dates for purchasing.
      h. Scheduled date of fabrication.
      i. Scheduled dates for installation.
      j. Activity or event number.

1.5 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:
   1. Project name.
   2. Date.
   3. Name of Architect.
   4. Name of Contractor.
   5. Name of firm or entity that prepared submittal.
   6. Names of subcontractor, manufacturer, and supplier.
   7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
   8. Category and type of submittal.
   9. Submittal purpose and description.
   10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
   11. Drawing number and detail references, as appropriate.
   12. Indication of full or partial submittal.
   13. Location(s) where product is to be installed, as appropriate.
   14. Other necessary identification.
   15. Remarks.
   16. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Paper Submittals:
1 Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
2 Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3 Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
4 Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
5 Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
6 Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using an approved transmittal form.

E. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.6 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package, and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
   a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
2. Paper: Prepare submittals in paper form, and deliver to Architect.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1 Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2 Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3 Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4 Coordinate transmittal of submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review submittals concurrently for coordination.
   a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. 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 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 15 days for review of each resubmittal.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1 Note date and content of previous submittal.
2 Note date and content of revision in label or title block and clearly indicate extent of revision.
3 Resubmit submittals until they are marked with approval notation from Architect's action stamp.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.7 SUBMITTAL REQUIREMENTS

A. 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 unsuitable 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 that show 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 Shop Drawings, and before or concurrent with Samples.

B. 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. Paper 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 24 by 36 inches.

a. Two opaque (bond) copies of each submittal. Architect will return one copy.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
   a. Project name and submittal number.
   b. Generic description of Sample.
   c. Product name and name of manufacturer.
   d. Sample source.
   e. Number and title of applicable Specification Section.
   f. Specification paragraph number and generic name of each item.
3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
4. Paper Transmittal: Include paper transmittal including complete submittal information indicated.
5. 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 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.
6. 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.

7. 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.

D. 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.

E. 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.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

   1 Certificates and Certifications Submittals: Submit a statement that includes 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. Provide a notarized signature where indicated.
   2 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.
   3 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.
   4 Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
   5 Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
   6 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. Test and Research Reports:
   1. 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.
   2. 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.

3. 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.
4. 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.
5. 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.
6. 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:
   a. Name of evaluation organization.
   b. Date of evaluation.
   c. Time period when report is in effect.
   d. Product and manufacturers' names.
   e. Description of product.
   f. Test procedures and results.
   g. Limitations of use.

1.8 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.9 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.
   1 PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.
   2 Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action**.**

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Architect will discard submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1 Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
   2 Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
   3 Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
   4 Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant,

mill, factory, or shop.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

I. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.4 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for direction before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 ACTION SUBMITTALS

A. Shop Drawings: For mockups.

1 Include plans, sections, and elevations, indicating materials and size of mockup construction.
2 Indicate manufacturer and model number of individual components.
3 Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

B. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.7 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1 Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2 Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1 Specification Section number and title.
2 Entity responsible for performing tests and inspections.
3 Description of test and inspection.
4 Identification of applicable standards.
5 Identification of test and inspection methods.
6 Number of tests and inspections required.
7 Time schedule or time span for tests and inspections.
8 Requirements for obtaining samples.
9 Unique characteristics of each quality-control service.

F. Reports: Prepare and submit certified written reports and documents as specified.
G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's Construction Schedule.

B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1 Contractor-performed tests and inspections including Subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
2 Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
3 Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.9 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1 Name, address, telephone number, and email address of technical representative making report.
2 Statement on condition of substrates and their acceptability for installation of product.
3 Statement that products at Project site comply with requirements.
4 Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5 Results of operational and other tests and a statement of whether observed performance complies

with requirements.
6 Statement whether conditions, products, and installation will affect warranty.
7 Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1 Name, address, telephone number, and email address of factory-authorized service representative making report.
2 Statement that equipment complies with requirements.
3 Results of operational and other tests and a statement of whether observed performance complies with requirements.
4 Statement whether conditions, products, and installation will affect warranty.
5 Other required items indicated in individual Specification Sections.

1.10 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer

who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

   a. Provide test specimens representative of proposed products and construction.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
   d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
   e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
   f. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.11 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1 Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2 Payment for these services will be made from testing and inspection allowances, as authorized by Change Orders.
3 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.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

2. Engage a qualified testing agency to perform quality-control services.
   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by

Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1 Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2 Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3 Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4 Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5 Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6 Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Associated Contractor Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1 Access to the Work.
2 Incidental labor and facilities necessary to facilitate tests and inspections.
3 Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4 Facilities for storage and field curing of test samples.
5 Delivery of samples to testing agencies.
6 Preliminary design mix proposed for use for material mixes that require control by testing agency.
7 Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1 Date test or inspection was conducted.
2 Description of the Work tested or inspected.
3 Date test or inspection results were transmitted to Architect.
4 Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, 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 or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

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 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "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.

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

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. "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.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "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.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO -American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.

30. ASCE/SEI -American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE -American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME -ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC -Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA -BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF -Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
49. CDA - Copper Development Association; www.copper.org.
50. CE - Conformite Europeenne; http://ec.europa.eu/growth/single-market/ce-marking/
51. CEA - Canadian Electricity Association; www.electricity.ca.
52. CEA - Consumer Electronics Association; www.ce.org.
53. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.pbmdf.com.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - CSA Group; www.csa.ca.
65. CSA - CSA International; (Formerly: IAS -International Approval Services); www.csa-international.org.
66. CSI - Construction Specifications Institute (The); www.csinet.org.
67. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
71. DHI - Door and Hardware Institute; www.dhi.org.
72. ECA - Electronic Components Association; (See ECIA).
73. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
74. ECIA - Electronic Components Industry Association; www.eciaonline.org.
75. EIA - Electronic Industries Alliance; (See TIA).
76. EIMA - EIFS Industry Members Association; www.eima.com.
77. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.

78. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org .
79. ESTA - Entertainment Services and Technology Association; (See PLASA).
80. ETL - Intertek (See Intertek); www.intertek.com.
81. EVO - Efficiency Valuation Organization; www.evo-world.org.
82. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
83. FIBA -Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
84. FIVB -Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
85. FM Approvals - FM Approvals LLC; www.fmglobal.com.
86. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
87. FRSA -Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
88. FSA - Fluid Sealing Association; www.fluidsealing.com.
89. FSC - Forest Stewardship Council U.S.; www.fscus.org.
90. GA - Gypsum Association; www.gypsum.org.
91. GANA - Glass Association of North America; www.glasswebsite.com.
92. GS - Green Seal; www.greenseal.org.
93. HI - Hydraulic Institute; www.pumps.org.
94. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
95. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
96. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
97. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
98. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
99. IAS - International Accreditation Service; www.iasonline.org.
100. IAS - International Approval Services; (See CSA).
101. ICBO - International Conference of Building Officials; (See ICC).
102. ICC - International Code Council; www.iccsafe.org.
103. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
104. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
105. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
106. IEC - International Electrotechnical Commission; www.iec.ch.
107. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
108. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
109. IESNA - Illuminating Engineering Society of North America; (See IES).
110. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
111. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
112. IGSHPA -International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
113. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
114. Intertek -Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
115. ISA -International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
116. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
117. ISFA -International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
118. ISO - International Organization for Standardization; www.iso.org.
119. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
120. ITU - International Telecommunication Union; www.itu.int/home.
121. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
122. LMA - Laminating Materials Association; (See CPA).

123. LPI - Lightning Protection Institute; www.lightning.org.
124. MBMA - Metal Building Manufacturers Association; www.mbma.com.
125. MCA - Metal Construction Association; www.metalconstruction.org.
126. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
127. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
128. MHIA - Material Handling Industry of America; www.mhia.org.
129. MIA - Marble Institute of America; www.marble-institute.com.
130. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
131. MPI - Master Painters Institute; www.paintinfo.com.
132. MSS -Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
133. NAAMM -National Association of Architectural Metal Manufacturers; www.naamm.org.
134. NACE -NACE International; (National Association of Corrosion Engineers International); www.nace.org.
135. NADCA - National Air Duct Cleaners Association; www.nadca.com.
136. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
137. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
138. NBI - New Buildings Institute; www.newbuildings.org.
139. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
140. NCMA - National Concrete Masonry Association; www.ncma.org.
141. NEBB - National Environmental Balancing Bureau; www.nebb.org.
142. NECA - National Electrical Contractors Association; www.necanet.org.
143. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
144. NEMA - National Electrical Manufacturers Association; www.nema.org.
145. NETA - InterNational Electrical Testing Association; www.netaworld.org.
146. NFHS - National Federation of State High School Associations; www.nfhs.org.
147. NFPA - National Fire Protection Association; www.nfpa.org.
148. NFPA - NFPA International; (See NFPA).
149. NFRC - National Fenestration Rating Council; www.nfrc.org.
150. NHLA - National Hardwood Lumber Association; www.nhla.com.
151. NLGA - National Lumber Grades Authority; www.nlga.org.
152. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
153. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
154. NRCA - National Roofing Contractors Association; www.nrca.net.
155. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
156. NSF - NSF International; www.nsf.org.
157. NSPE - National Society of Professional Engineers; www.nspe.org.
158. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
159. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
160. NWFA - National Wood Flooring Association; www.nwfa.org.
161. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
162. PDI - Plumbing & Drainage Institute; www.pdionline.org.
163. PLASA -PLASA; (Formerly: ESTA -Entertainment Services and Technology Association); http://www.plasa.org.
164. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
165. RFCI - Resilient Floor Covering Institute; www.rfci.com.
166. RIS - Redwood Inspection Service; www.redwoodinspection.com.
167. SAE - SAE International; www.sae.org.
168. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
169. SDI - Steel Deck Institute; www.sdi.org.
170. SDI - Steel Door Institute; www.steeldoor.org.
171. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.

172. SEI/ASCE -Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
173. SIA - Security Industry Association; www.siaonline.org.
174. SJI - Steel Joist Institute; www.steeljoist.org.
175. SMA - Screen Manufacturers Association; www.smainfo.org.
176. SMACNA -Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
177. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
178. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
179. SPIB - Southern Pine Inspection Bureau; www.spib.org.
180. SPRI - Single Ply Roofing Industry; www.spri.org.
181. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
182. SSINA - Specialty Steel Industry of North America; www.ssina.com.
183. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
184. STI - Steel Tank Institute; www.steeltank.com.
185. SWI - Steel Window Institute; www.steelwindows.com.
186. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
187. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
188. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
189. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
190. TIA -Telecommunications Industry Association (The); (Formerly: TIA/EIA Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
191. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
192. TMS - The Masonry Society; www.masonrysociety.org.
193. TPI - Truss Plate Institute; www.tpinst.org.
194. TPI - Turfgrass Producers International; www.turfgrasssod.org.
195. TRI - Tile Roofing Institute; www.tileroofing.org.
196. UL - Underwriters Laboratories Inc.; http://www.ul.com.
197. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
198. USAV - USA Volleyball; www.usavolleyball.org.
199. USGBC - U.S. Green Building Council; www.usgbc.org.
200. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
201. WA - Wallcoverings Association; www.wallcoverings.org
202. WASTEC - Waste Equipment Technology Association; www.wastec.org.
203. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
204. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
205. WDMA - Window & Door Manufacturers Association; www.wdma.com.
206. WI - Woodwork Institute; www.wicnet.org.
207. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
208. WWPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1 DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2 IAPMO -International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3 ICC - International Code Council; www.iccsafe.org.
4 ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC -Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov/fdsys.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL -Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB -Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
15. USDA -Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ -Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR -Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD -Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS -Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.

a. Available from Defense Standardization Program; www.dsp.dla.mil.
b. Available from General Services Administration; www.gsa.gov.
c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.

6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB -U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1 CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2 CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.

3 CDHS; California Department of Health Services; (See CDPH).
4 CDPH; California Department of Public Health; Indoor Air Quality Program; www.caliaq.org.
5 CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6 SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7 TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservice.tamu.edu.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used) END OF SECTION

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.

B. Water Service: Pay water-service use charges for water used by all entities for construction operations.

C. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

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

E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts.

B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide bases for supporting posts.

C. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

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

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1 Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

2 Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

3 Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures."

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

3.2 INSTALLATION, GENERAL

A. Locate facilities 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.

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

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 completed permanent facilities.

3.3 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. Sanitary Facilities: Provide temporary toilets, wash facilities, 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.

C. Temporary Heating and Cooling: Provide temporary heating and cooling 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.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

D. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service overhead unless otherwise indicated.

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

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

F. Telephone Service: Provide temporary telephone service for use by all construction personnel. Install WiFi cell phone access equipment and one land-based telephone 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. Owner's office.
   g. Principal subcontractors' field and home offices.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in 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.

1 Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2 Prepare subgrade and install subbase and base for temporary roads and paved areas according to requirements indicated on Drawings.
3 Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
4 Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according requirements indicated on Drawings.

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

1 Protect existing site improvements to remain including curbs, pavement, and utilities.
2 Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking: Provide temporary parking areas for construction personnel.

F. 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 a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2 Remove snow and ice as required to minimize accumulations.

G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touch up signs so they are legible at all times.

H. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

J. 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.

3.5 SECURITY AND PROTECTION 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.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

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.

1. Comply with work restrictions specified in Section 011000 "Summary."

C. Temporary Erosion and Sedimentation Control: Comply with requirements indicated on Drawings and the following:

1 Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
2 Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.

3 Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
4 Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
5 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Site Enclosure Fence: Prior to commencing earthwork, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.

F. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

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

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

I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

J. 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.

1 Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2 Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3 Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4 Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1 Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
2 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 procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3 Indicate methods to be used to avoid trapping water in finished work.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1 Protect porous materials from water damage.
2 Protect stored and installed material from flowing or standing water.
3 Keep porous and organic materials from coming into prolonged contact with concrete.
4 Remove standing water from decks.
5 Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1 Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2 Keep interior spaces reasonably clean and protected from water damage.
3 Periodically collect and remove waste containing cellulose or other organic matter.
4 Discard or replace water-damaged material.
5 Do not install material that is wet.
6 Discard and replace stored or installed material that begins to grow mold.
7 Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1 Control moisture and humidity inside building by maintaining effective dry-in conditions.
2 Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3 Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
   a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
   b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
   c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1 Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2 Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3 At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1 Section 012100 "Allowances" for products selected under an allowance.
2 Section 012300 "Alternates" for products selected under an alternate.
3 Section 012500 "Substitution Procedures" for requests for substitutions.
4 Section 014200 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased 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 that 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 Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

1.4 ACTION SUBMITTALS

A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
   a. Form of Architect's Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
   b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1 Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2 If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
   a. Name of product and manufacturer.
   b. Model and serial number.

c. Capacity.
d. Speed.
e. Ratings.

3. See individual identification sections in Divisions 21, 22, 23, and 26 for additional identification requirements.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1 Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2 Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3 Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4 Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1 Store products to allow for inspection and measurement of quantity or counting of units.
2 Store materials in a manner that will not endanger Project structure.
3 Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4 Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5 Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6 Protect stored products from damage and liquids from freezing.
7 Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent 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 form properly executed.

3 See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 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 Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.

4 Where products are accompanied by the term "as selected," Architect will make selection.

5 Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

6 Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Evaluation of "or equal" product status is by the Architect, whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: …"

2. Sole 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.

a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with

requirements, provide products by the following: …"

3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.

    a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: …"

4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, which complies with requirements.

    a. Non-limited list of products is indicated by the phrase: "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following: …"

5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.

    a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: …"

6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, which complies with requirements.

    a. Non-limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following: …"

7. 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 by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

    a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

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.

    1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

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.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1 Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
2 Evidence that proposed product provides specified warranty.
3 List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
4 Samples, if requested.

B. Submittal Requirements: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1 Construction layout.
2 Field engineering and surveying.
3 Installation of the Work.
4 Coordination of Owner-installed products.
5 Progress cleaning.
6 Starting and adjusting.
7 Protection of installed construction.

B. Related Requirements:

1 Section 011000 "Summary" for limits on use of Project site.
2 Section 013300 "Submittal Procedures" for submitting surveys.
3 Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor, certifying that location and elevation of improvements comply with requirements.

C. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1 Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.
2 Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1 Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2 Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3 Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. 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.

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

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility 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. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1 Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2 Establish limits on use of Project site.
3 Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4 Inform installers of lines and levels to which they must comply.
5 Check the location, level and plumb, of every major element as the Work progresses.
6 Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7 Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

- Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
- Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
- Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
- Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
- Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
- Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

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.
4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.

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

H. 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, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

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. Repair or remove and replace damaged, defective, or nonconforming Work.

1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 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 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.

4. Coordinate progress cleaning for joint-use areas where Contractor and others are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

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. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

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 ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Disposing of nonhazardous construction waste.

B. Related Requirements:

1 Section 042000 "Unit Masonry" for disposal requirements for masonry waste.
2 Section 047200 "Cast Stone Masonry" for disposal requirements for excess stone and stone waste.

1.3 DEFINITIONS

A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.

C. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

1.5 INFORMATIONAL SUBMITTALS

A. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators.

1. Construction Waste:

a. Masonry and Concrete.
b. Lumber.
c. Wood sheet materials.
d. Soils and Vegetation.
e. Fencing
j. Piping.
k. Electrical conduit, Light fixtures.
l. Packaging:
1) Paper.
2) Cardboard.
3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood crates.
7) Wood pallets.
8) Plastic pails.
m. Construction Office Waste:
1) Paper.
2) Aluminum cans.
3) Glass containers.

PART 3 - EXECUTION

3.1 DISPOSAL OF WASTE

A. General: Remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
1 Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2 Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1 Substantial Completion procedures.
2 Final completion procedures.
3 Warranties.
4 Final cleaning.
5 Repair of the Work.

B. Related Requirements:

1 Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
2 Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
3 Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at final completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other

Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. 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.

B. 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.

1. 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.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual 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.

    a. 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. Obtain Owner's signature for receipt of submittals.

5. Submit testing records.

6. Submit sustainable design submittals not previously submitted.

7. Submit changeover information related to Owner's use, operation, and maintenance.

C. Procedures 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.

1. Advise Owner of pending insurance changeover requirements.
2. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
3. Advise Owner of utility services.
4. Participate with Owner in conducting inspection and walkthrough.
5. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
6. Complete final cleaning requirements.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to 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.

1 Request reinspection when the Work identified in previous inspections as incomplete is completed or

corrected.

2 Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1 Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2 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.
3 Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4 Submit final completion photographic documentation.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to 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 a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. 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.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
   a. Project name.
   b. Date.
   c. Name of Architect.
   d. Name of Contractor.
   e. Page number.
4. Submit list of incomplete items in the following format:

   a. PDF electronic file. Architect will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when

delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
   1. Submit on digital media acceptable to Architect.

E. Warranties in Paper Form:
   1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
   2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

F. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 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 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 not planted, mulched, or 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 hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

3.2 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. 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.

2. 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.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1 Operation and maintenance documentation directory manuals.
2 Emergency manuals.
3 Systems and equipment operation manuals.
4 Systems and equipment maintenance manuals.
5 Product maintenance manuals.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1 Architect will comment on whether content of operation and maintenance submittals is acceptable.
2 Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:

1 Submit on digital media acceptable to Architect. Enable reviewer comments on draft submittals.
2 Submit three paper copies. Architect will return one copy.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are

acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1 Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2 File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
a. If oversize drawings are necessary, fold drawings to same size as text pages and use as

foldouts.

b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1 Title page.
2 Table of contents.
3 Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 EMERGENCY MANUALS – not used

1.8 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1 Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2 Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1 Product name and model number. Use designations for products indicated on Contract Documents.
2 Manufacturer's name.
3 Equipment identification with serial number of each component.
4 Equipment function.
5 Operating characteristics.
6 Limiting conditions.
7 Performance curves.
8 Engineering data and tests.
9 Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1 Startup procedures.
2 Equipment or system break-in procedures.
3 Routine and normal operating instructions.
4 Regulation and control procedures.
5 Instructions on stopping.
6 Normal shutdown instructions.
7 Seasonal and weekend operating instructions.
8 Required sequences for electric or electronic systems.
9 Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.9 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers'

maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1 Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2 Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

   a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1 Test and inspection instructions.
2 Troubleshooting guide.
3 Precautions against improper maintenance.
4 Disassembly; component removal, repair, and replacement; and reassembly instructions.
5 Aligning, adjusting, and checking instructions.
6 Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1 Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.

2 Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of maintenance manuals.

1.10 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:

1 Product name and model number.
2 Manufacturer's name.
3 Color, pattern, and texture.
4 Material and chemical composition.
5 Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1 Inspection procedures.
2 Types of cleaning agents to be used and methods of cleaning.
3 List of cleaning agents and methods of cleaning detrimental to product.
4 Schedule for routine cleaning and maintenance.
5 Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823 SECTION

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1 Record Drawings.
2 Record Specifications.
3 Record Product Data.
4 Miscellaneous record submittals.

B. Related Requirements:

1 Section 017300 "Execution" for final property survey.
2 Section 017700 "Closeout Procedures" for general closeout procedures.
3 Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1 Number of Copies: Submit copies of record Drawings as follows:
a. Initial Submittal:
1) Submit PDF electronic files of scanned record prints and one of file prints.
2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:
1) Submit PDF electronic files of scanned record prints and three sets of prints. 2) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Reports: Submit written report indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections,

and other notations incorporated.

1.4 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

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 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.
   d. Locations and depths of underground utilities.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuitry.
   g. Actual equipment locations.
   j. Changes made by Change Order. .
   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 alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
   1. Format: Annotated PDF electronic file with comment function enabled.
   2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
   3. Refer instances of uncertainty to Architect for resolution.
   4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
      a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
      b. Architect will provide data file layer information. Record markups in separate layers.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD

DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
   d. Name of Architect.
   e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
   1 Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2 Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   3 Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
   4 For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
   5 Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.

1.6 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
   1 Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2 Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
   3 Note related Change Orders, record Specifications, and record Drawings where applicable.

C. Format: Submit record Product Data as scanned PDF electronic file(s) of marked-up paper copy of Product Data.

   1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.8 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store record documents in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017839

SPECIFICATIONS FOR
SOIL EROSION AND SEDIMENT CONTROL

Description

This work shall be in accordance with Division 2, Section 208 of the 2020 MDOT Standard Specifications except as herein specified.

1. The CONTRACTOR shall furnish and install of all soil erosion and sedimentation control measures as shown on the soil erosion and sedimentation control plans and as directed by the Engineer.
2. The CONTRACTOR shall maintain of all measures to ensure that sediment does not build up in the drainage structure. This does not include poking holes in the silt sacks to allow flow into the structure. The silt sack has to be removed from the structure, cleaned thoroughly, and properly reinstalled in the structure.
3. The CONTRACTOR shall clean the sediment out of all the drainage structures after the project has been completely restored.
4. Any silt sacks damaged or destroyed during construction shall be replaced with a new silt sack by the Contractor at no additional cost to the Owner.
5. All measures must remain in place until the project area has been completely restored and vegetative growth established.

SPECIFICATIONS FOR
REMOVE EXISTING TREES AND LANDSCAPING

Description:

This work shall be in accordance with Division 2, Section 202 of the 2020 MDOT Standard Specifications, except as herein specified.

This item shall include the complete removal of existing trees, bushes and hedges, six (6) inches in diameter or greater as called for on the plans. Removal shall include the complete removal of stump and associated root ball. The trees removed shall be disposed of immediately at an off-site location designated by the CONTRACTOR. Tree removal shall be conducted carefully so not to cause damage to adjacent properties or items such as pavements, sidewalks and landscaped areas within the ROW. Any damage caused by tree removal shall be repaired and paid for by the CONTRACTOR.

SPECIFICATIONS FOR
COLD MILLING HMA SURFACE

Description

This work shall be in accordance with Division 5, Section 501 of the 2020 MDOT Standard Specifications, except as herein specified & include all labor, equipment and materials to complete full removal, loading, hauling and disposal of the milled material as called for in the plans.

All material must be disposed of at an off-site location designated by the Contractor.

SPECIFICATIONS FOR REMOVING PAVEMENT

Description

This work shall be in accordance with Division 2, Section 204 of the 2020 MDOT Standard Specifications and per Wayne County specifications within Wayne County right-of-ways, except as herein specified and include the complete removal of existing pavement, including concrete pavements, asphalt pavements, asphalt cap along with concrete curb and gutter, as called for in the plans and as directed by the ENGINEER.

All pavements shall be removed by sawcutting to the full depth of the concrete or asphalt pavement. Any pavements partially sawcut shall be recut at the CONTRACTOR's expense to full depth. Any damage to adjacent pavement to be kept in place due to incomplete sawcutting shall be repaired at the CONTRACTOR's expense.

All removed pavements and existing base materials shall be removed from the site and disposed of at an off-site location designated by the CONTRACTOR.

SPECIFICATIONS FOR REMOVING SEWERS

Description

This work shall be in accordance with Division 2, Section 203 of the 2020 MDOT Standards Specifications, except as herein specified.

The CONTRACTOR will install any extra backfilling, which may be required as a result of this removal work, as directed by the ENGINEER.

The CONTRACTOR is responsible for placement of any temporary pavement to maintain traffic flow after the removal of the sewer. The actual areas and types of pavement, where the temporary pavement will be installed, will be determined by the ENGINEER.

The CONTRACTOR is responsible for installation of permanent bulkheads as needed and as directed by the ENGINEER.

SPECIFICATIONS FOR
REMOVING SIDEWALKS

Description

This work shall be in accordance with Division 2, Sections 204 of the 2020 MDOT Standard Specifications, except as herein specified.

The removal of existing sidewalks will be as needed for the removal of pavement, and as directed by the ENGINEER.

Any existing base material removed when removing pavement shall be replaced with similar material back to its original grade, as approved by the ENGINEER.

SPECIFICATIONS FOR
MISCELLANEOUS REMOVALS

Description

This work shall be in accordance with Division 8, Sections 810 of the 2020 MDOT Standard Specifications, except as herein specified.

1. The CONTRACTOR shall remove all miscellaneous structures as shown on the plans as directed by the ENGINEER and salvage items to the Owner or Township DPW.
2. The CONTRACTOR shall reinstate said traffic signs at the completion of the job as directed by the ENGINEER.
3. Posts or signs damaged by the CONTRACTOR shall be replaced at the CONTRACTOR'S expense.
4. The CONTRACTOR shall remove fence and replace as directed on plans or by ENGINEER. Note that fence replacement will only be required to facilitate construction and must be approved by the ENGINEER.

SPECIFICATIONS FOR
SIGN REMOVAL, SALVAGE AND REINSTALLATION

Description

This work shall be in accordance with Division 8, Section 810 of the 2020 MDOT Standard Specifications except as herein specified.

1. The CONTRACTOR shall remove traffic signs within the right-of-way as shown on the construction plans or as directed by the ENGINEER and be delivered to the Township of Brownstown Department of Public Services yard.
2. Any signs removed or destroyed during construction and not taken to the Department of Public Services yard shall be replaced by the CONTRACTOR at his expense.
3. All other signs on the site shall remain in place unless directed by the ENGINEER to remove, salvage and replace at the end of construction. All signs not called out for removal that may be damaged or destroyed during construction shall be replaced in kind by the Contractor at his expense.
4. Signs removed per the plans and at direction of the ENGINEER shall be re-installed at the completion of the project.
5. If the signs were damaged due to contractor negligence, the CONTRACTOR will replace the sign with new ones at no cost to the Township.
6. If the existing sign is damaged previously, the contractor will install a new sign and paid under “New Sign, Permanent” paid item.

SPECIFICATIONS FOR FENCE SALVAGING & REINSTALLATION

Description

This work shall be in accordance with Division 8, Section 808 of the 2020 MDOT Standard Specifications, except as herein specified.

The CONTRACTOR shall remove and salvage existing chain link fence as shown on the plans and as directed by the Engineer. Removed fence and appurtenances shall be stored in a manner so as to protect from any damage caused by the CONTRACTOR'S operations or from vandalism. Any fence and appurtenances that suffers damage shall be replaced at no additional cost to the Township of Brownstown.

Any unsalvageable fence shall be disposed of offsite by the CONTRACTOR.

The CONTRACTOR shall install salvaged fence and appurtenances as shown on the plans and as directed by the ENGINEER.

The CONTRACTOR shall install new fence as shown on the plan and as directed by the ENGINEER. The new fence shall be of the same type, material, size and height of the adjacent existing fence.

The CONTRACTOR shall install new fence posts as shown on the plans and as directed by the ENGINEER. The new fence posts shall be of the same type, material, size and height of the adjacent existing posts.

SPECIFICATIONS FOR
SUBGRADE UNDERCUTTING

Description

This work shall be in accordance with Division 2, Section 205 of the 2020 MDOT Standard Specifications except as herein specified.

1. The excavation of all unsuitable materials below the proposed pavement subbase course as determined by the ENGINEER.
2. Subgrade Undercutting shall be accomplished within the limits as established by the ENGINEER. All such excavated material shall be disposed of by the CONTRACTOR.
3. The areas excavated of unsuitable material that are excavated shall be backfilled with 21AA aggregate base meeting the requirements of the "Specifications for Aggregate Base (CIP)" or MDOT 1" x 3" course aggregate (commercial graded material with particle sized from ¾ inches to 3 inches.

SPECIFICATIONS FOR EARTHWORK

Description

This work shall be in accordance with Division 2 of the 2020 MDOT Standard Specifications and as otherwise described in this specification. The work under this section includes, but is not necessarily limited to, the following items:

1. Excavating
2. Filling and backfilling
3. Trenching
4. Rough and finish grading
5. Removal of trees and stumps

Job Conditions

Dust Control

1. Use all means necessary to control dust on and near the work and on and near all off-site borrow areas if such dust is caused by the CONTRACTOR's operations during performance of the work or if resulting from the condition in which the CONTRACTOR leaves the site.
2. Thoroughly moisten or otherwise treat all surfaces as required to prevent dust being a nuisance to the public, neighbors and concurrent performance of other work on the site. If the ENGINEER determines that chloride shall be used to control dust, the CONTRACTOR shall comply at no additional cost.
3. Roadways and/or sidewalks adjacent to the work shall be swept a minimum of once each working day.
4. Failure to comply with the above dust control measures may cause suspension of work until the CONTRACTOR has all dust on-site and off-site under control.

Protection

1. The CONTRACTOR is solely responsible for using all means necessary to protect all materials before, during and after installation and to protect all objects designated to remain.
2. In the event of damage, the CONTRACTOR shall immediately make all repairs and replacements necessary to the approval of the ENGINEER and at no additional cost to the OWNER.

Public Utilities and Underground Structures

1. All public utilities and underground structures encountered during this work shall be adequately supported and protected.
2. Before backfilling, public utilities and underground structures shall be permanently supported as approved by the ENGINEER and the OWNER of the public utility or underground structure.
3. Public utilities and underground structures damaged or disturbed during performance of the work shall be repaired or replaced in a manner equal to the original condition at no additional expense to the OWNER.
4. For public improvement projects, the existing public utilities and underground structures are shown on the drawings, insofar as information is reasonably available. The information shown is believed to be reasonably correct and complete, although neither the correctness, nor the completeness, of such information is guaranteed by the OWNER or ENGINEER.

5. CONTRACTORS shall comply with State Act 53, MISS DIG and notify MISS DIG three (3) working days, excluding weekends and holidays, prior to performing any excavating.
6. The relocation of any utility, not specifically called for on the plans, but required to perform the work, shall be the CONTRACTOR's responsibility and performed at no additional expense to the OWNER.

Disposal of Excavated Material

1. The CONTRACTOR is to properly remove and dispose of all excavated material not needed for the completion of the work. For public improvement projects, all required permits and their associated costs for filling dumping, disposing, etc., of excess material are the responsibility of the CONTRACTOR.
2. Any possible inconsistencies that may exist between the requirements included herein and the requirements of the Brownstown Department of Public Service for work under their jurisdiction will be resolved by the ENGINEER at the time such inconsistency is identified.

PRODUCTS

General

The type of material required for either bedding or backfill material is specified below. The locations where these are to be used are specified elsewhere and/or are shown on the plans.

Trench A: On Site Fill Material

1. "Trench A" is to be used in all trenches within or parallel and adjacent to the right-of-way, except where MDOT Class II Granular Material (Trench B) is required.
2. "Trench A" shall be backfilled with suitable, approved, excavated material (excluding blue clay).

Trench B: MDOT Class II Granular Backfill

1. "Trench B" is to be used in all trenches within, parallel or adjacent to the right-of-way.
2. "Trench B" shall be backfilled with MDOT Class II Granular Material.

Trench C: Isolated Road Cuts

1. "Trench C" shall be used in all trenches needed for isolated road cuts.
2. "Trench C" shall be backfilled with "K-Krete" or an approved equal flowable fill.

Aggregate

Aggregate used for road base, driveway base, shoulders, or other areas shown on the plans shall be MDOT 21AA crushed limestone. Utilize MDOT 21AA crushed blast furnace slag for road base, drive approach and sidewalk base, or other areas shown on the plans with the exception of shoulders or wearing surfaces. Utilize MDOT 21AA crushed concrete for drive approach and sidewalk base only.

Pipe Bedding Material

Pipe bedding material shall consist of MDOT Class II Granular Material unless otherwise shown on the plans. If unstable soil conditions or obstructions (other than rock), require excavation of the sewer trench below the elevation shown on the plans, undercut, backfill, and compact the trench as directed by the ENGINEER using MDOT 6A, 17A or 34R crushed limestone or blast furnace slag aggregate. Material that was undercut will be disposed as previously described in this specification.

Other Materials.

All other materials not specifically described but required for the proper completion of the work in this section shall have prior approval of the ENGINEER.

EXECUTION

General

1. Familiarization: Prior to all work of this section, become thoroughly familiar with the site, site condition, and all portions of the work falling within this section.
2. Backfilling Prior to Approvals: Do not allow or cause any of the work performed or installed to be covered up or enclosed prior to all required inspections, tests and approvals. Should any of the work be so enclosed or covered up before it has been approved, uncover all such work at no additional cost. After the work has been completely inspected, tested and approved, make all repairs and replacements necessary to restore the work to the condition in which it was found at the time of uncovering, all at no additional cost to the OWNER.
3. Work Within Easements: Confine work to immediate area of pipe. Notify property OWNERS before moving equipment on easements and use access routes designated by the OWNER. Remove all stockpiled topsoil within easements and replace it after completion of work within the easement. Replace and remove trees, shrubs, bushes and lawns to the satisfaction of the property OWNER and ENGINEER.

Compaction

1. The procedure to compact backfill, base and embankment is the Controlled Density Method as described in the MDOT Density Control Handbook and in accordance with the current MDOT Standard Specifications For Construction, ASTM D 2321, as specified below or as otherwise directed by the ENGINEER.
2. "Trench A" shall be compacted in one-foot (1') layers to 90% of its maximum unit weight.
3. "Trench B" shall be compacted in one-foot (1') layers to 95% of its maximum unit weight.
4. Aggregate base for concrete pavement, drive approaches and sidewalks will be compacted in one foot (1') layers to 95% of its maximum unit weight.
5. Aggregate base for HMA pavements, and sidewalk will be compacted to 98% of its maximum unit weight.
6. Subgrade beneath aggregate base, embankment, fill or other backfill, unless otherwise directed by the ENGINEER will be compacted to 95% of its maximum unit weight.
7. Unless otherwise specified or directed by the ENGINEER, the maximum unit weight will be determined by the MDOT One-Point T-99 Test, MDOT One-Point Michigan Cone Test or MDOT Michigan Modified T-180 Test.
8. In place density will be determined using a nuclear density gauge.
9. Ramping by bull dozer is not acceptable.

Lines and Grades

1. For Brownstown projects, initial lines and grades shall be established by the ENGINEER and for private development projects this work shall be established by a licensed surveyor in the State of Michigan hired by the CONTRACTOR or OWNER.
2. On Brownstown projects, the CONTRACTOR is responsible for preserving all data, monuments and/or stakes installed by the ENGINEER.
3. On Brownstown projects, if any data, monuments and/or stakes are displaced, damaged, or lost, they shall be immediately replaced by the ENGINEER and the CONTRACTOR will be back charged for time and material required to complete the work.

Obstructions

1. Remove and dispose of all stumps, roots, boulders, sidewalks, driveways, pavement, pipes and the like, as required for the performance of the work. Trees are to be removed only as a last resort and under direction of OWNER.
2. Exercise care in excavating around catch basins, inlets and manholes. Avoid removing or loosening castings or pushing soil into structures. Damaged or displaced castings shall be

repaired and/or replaced, and all soil entering the structures during the performance of the work shall be removed at no additional cost to the OWNER.

Excavating

1. General: Excavating includes the loosening, loading, removing, transporting and disposing of all materials of whatever nature encountered, including rock excavation; the furnishing and placing of earth supports, if required; and all necessary work for dewatering the excavation.
2. Excess Excavation: If excess excavation is made or the earth foundation becomes disturbed so as to require removal beyond the prescribed limits, the resulting space shall be refilled with materials and in a manner approved by the ENGINEER. If the area is under wall footings or similar locations, the ENGINEER may require the area to be filled with concrete.
3. Depressions Resulting from Removal of Obstructions: Where depressions result from or have resulted from the removal of surface or subsurface obstructions, open the depression to equipment working width and remove all debris and soft material a directed by the ENGINEER.
4. Other Areas: Excavate to grades shown on the drawings. Where excavation grades are not shown on the drawings, excavate as required to accommodate the given installation.

Trench Excavating

1. General: Perform all trenching per local, state and federal regulations required for the installation of items where the trenching is not specifically described in other sections of these specifications. All trench excavations, except where tunneling or boring is not indicated on the drawings, and where necessary to tunnel under tree roots and other obstructions, may be open cut from the surface. Continuously maintain all excavated trenches and backfill to finish grade all settlement that occurs within a period of 60 days of original backfilling.
2. Depth: Excavate as required to provide the elevations and depths of cover shown on the drawings.
3. Width: Refer to the Township of Brownstown details.

    - PVC Pipes – minimum trench width = 1.5 x O.D. + 12” (for all installation depths)
    - HDPE Pipe – used for storm sewer detention only. Minimum trench width = 3 x O.D. (for installation depths below 10’) (O.D. = outside diameter)
    - Concrete Pipe: Refer to the Brownstown Storm Standard Details.
    - Ductile Iron Pipe: Refer to the Brownstown Water Main Standard Details.

4. Excess Excavation: Where trench excavation is carried below proper elevation and where depressions are created by removal of foreign materials, such as wood and boulders, the trench shall be brought to the proper elevation by placing and compacting to 95 percent, MDOT 21AA crushed limestone or blast furnace slag, or other materials as approved by the ENGINEER.
5. Trench Sheeting and Bracing: Properly support all ditches in locations indicated on the drawings and where necessary to conform to all pertinent local, state and federal rules and regulations and these specifications, even though such locations are not shown on the drawings. Brace, sheet and support trench walls in such a manner that they will be safe and that the ground alongside the excavation will not slide or settle and that all existing improvements of every kind whether on public or private property will be fully protected

from damage. In the event of damage to such improvements, immediately make all repairs and replacements necessary to the satisfaction of the ENGINEER and at no additional cost to the OWNER. Arrange all bracing, sheeting, and shoring in order to not place stress on any portion of the completed work until the general construction thereof has proceeded far enough to provide sufficient strength.

6. Removal of Trench Sheeting and Bracing: Exercise care in the drawing and removal of sheeting, shoring, bracing, and timbering to prevent collapse of the excavation faces being supported and damaging the work installed. Do not leave any sheeting or bracing in the trench after completion of the work unless approved by the ENGINEER.

Pipe Bedding

1. General: Place bedding material in the trench simultaneously on each side of the pipe for the full width of the trench to a minimum depth of one foot (1') above the outside diameter of the pipe barrel unless otherwise shown on the drawings. Unstable soil conditions will be addressed as previously described in this specification.
2. Compaction: All compaction shall meet the requirements of ASTM D2321 or as otherwise stated in this specification. Compact the bedding material with mechanical tampers after placing. Take special care to provide firm bearing support on the underside of the pipe and fittings or the full length of the pipe.

Excess Water Control

1. Unfavorable Weather: Do not place, spread or roll any fill material during unfavorable weather conditions. Do not resume operations until moisture content and fill density are satisfactory to the ENGINEER.
2. Flooding: Provide berms or channels to prevent flooding of subgrade. Promptly remove all water collecting in depressions.
3. Softened Subgrade: Where soil has been softened or eroded by flooding or placement during unfavorable weather, remove all damaged areas, backfill, and compact as specified for fill compaction.
4. Pumping and Drainage: Provide, maintain and use at all times during construction adequate means and devices to promptly remove and dispose of all water from every source entering the excavations or other parts of the work. Dewater by means, which will ensure dry excavations, preserve final lines and grades and not disturb or displace adjacent soil. All pumping and drainage shall be done with no damage to property or structures and without interference with the rights of the public, OWNERs or private property, pedestrians, vehicular traffic, or the work of other CONTRACTORs. Do not overload or obstruct existing drainage facilities.

Repairs and Replacements

1. Ditches: Where work under these Specifications is performed near ditches and an existing ditch is filled or disturbed, clean, repair and/or replace the ditch with properly pitched bottom and side slopes and of a section and capacity equal to the original section.
2. Head Walls and Culverts: Where head wall, culverts or other structures are present and it is necessary for their removal during this work or they have been disturbed or filled during this work, shall be re-laid at a proper grade or rebuilt to a condition equal to the original state.

Grading and Clean Up

1. After backfill has been completed, the site shall be rough-graded to either those elevations show on the plans or to original conditions.
2. Rough Grading shall follow as close behind backfilling and compaction as possible. In no case shall rough grading fall behind by more than 200 feet.

3. Use all means necessary to prevent the erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.
4. Upon completion of all excavation/earthwork, the CONTRACTOR shall be responsible for removal of all rubbish, trash, debris, and spoil piles resulting from construction operations and leave the site in a neat and orderly condition acceptable to the ENGINEER.

Restoration

1. All work required to restore the site shall be in accordance with the Brownstown Standard Specifications for Restoration.

SPECIFICATIONS FOR
WATER MAIN

Description

This work shall be in accordance with the applicable requirements of state and local health authorities having jurisdiction for disinfection and testing and shall conform to the standards set by:

- American National Standards Institute (ANSI)
- American Society of Testing and Materials (ASTM)
- American Water Works Association (AWWA)
- National Sanitation Foundation (NSF)

This work shall be in accordance with the Standard Specifications, listed above, and/or except as herein specified.

All water main, water main fittings and appurtenances must be MADE IN USA.

Any possible inconsistencies that may exist between the requirements included herein and the requirements of the Township Department of Public Services for work under their jurisdiction will be resolved by the ENGINEER at the time such inconsistency is identified.

Materials

Watermain Pipe

1. Ductile Iron Pipe: All ductile iron pipe shall conform to the standards of AWWA C151 (ANSI C21.51) and current NSF 61 Standard. The pipe joints shall be slip-type or push-on and conform to the standards of AWWA C111 (ANSI A21.4). The pipe shall be internally coated with a cement mortar lining conforming to the standards of AWWA C104 (ANSI A21.4). The pipe shall have a minimum thickness of Pressure Class 350 and conform to the standards of AWWA C150 (ANSI A21.50). The pipe shall externally have a bituminous coating of one (1) mil in thickness. When polyethylene encasement is specified, the polyethylene film shall have a minimum thickness of eight (8) mils and conform to the standards of AWWA C105 (ANSI A21.5). All pipe shall be delivered to the job site in full 18-foot or 20-foot lengths, clean and in sound condition. For the proposed ductile iron water main and appurtenances, each material in contact with potable water must meet ANSI/NSF Standard 61 and the certification shall be stamped on the exterior wall.

   A. Push-On Joints — joints shall be made by means of a compression-type push-on resilient gasket.

   B. Mechanical Joints — joints shall be made with a molded resilient gasket and cast iron follower gland.

   C. Flexible Joint Pipe — Flexible Joint Pipe shall be assembled, handled and installed in accordance with the printed recommendations that accompany the pipe and are provided by the manufacturer of the piping materials being installed.

2. Poly Vinyl Chloride (PVC) Pressure Pipe shall conform to the standards of ANSI/AWWA C900 and C909 and be certified to current NSF 14 and NSF 61 Standards. The pipe shall be made

from Class 12454-A or 12454-B virgin compounds as defined in ASTM D1784, and provide a hydrostatic design basis rating of 4,000 psi. The pipe shall have an outside diameter (OD) matching that of ductile iron pipe. The pipe pressure class shall be a minimum of 235 psi and a DR of less than or equal to DR18. Pipe shall be marked NSF 61 when used for portable water. The pipe shall have an integral wall-thickened bell end designed for joint assembly using a factory-installed elastomeric gasket. The gasket shall conform to the standards of ASTM D 2.22 and ASTM F 477 to affect the pressure seal. In addition the joint design shall meet the current requirements of ASTM D3139. The pipe shall be designed for direct connection to ductile iron pipe and fittings using an EBBA Iron MegaLug retainer gland specifically designed for PVC pressure pipe, approved by the ENGINEER and per the pipe manufacturer's recommendation. The pipe shall be third-party certified to meet NSF 14 & 61 and the exterior shall bear the stamp signifying the third-party certification.

3. High Density Polyethylene (HDPE) Pipe: This pipe is permitted only in nominal diameter sizes from eight inches (8") through twelve inches (12"). The pipe shall be designed for direct connection to ductile iron pipe and fittings using the mechanical joint adapter specifically designed for HDPE pipe as approved by the ENGINEER and per the pipe manufacturer's recommendation. The pipe shall have a nominal outside diameter (OD) matching that of ductile iron pipe. The minimum pressure class shall be 160 psi. HDPE pipe will be produced from resins meeting the requirements of ASTM D1248, designation PE4710, ASTM D3350 cell classification PE445574, and will meet the requirements of AWWA C901 and C906 with a minimum SDR of 11. Material taken from HDPE pipe will meet the minimum stability requirements of ASTM D3360. Pipe will be legibly marked at intervals of no more than five feet (5') with the manufacturer's name, trademark, pipe size, HDPE cell classification, appropriate legend such as SDR 11, ASTM D3035, AWWA C901, or C906, dates of manufacture and point of origin. All HDPE pipe shall be third-party certified to meet the current NSF 14 and NSF 61 Standards, and the exterior shall bear the stamp signifying the third-party certification.

4. Detectable Tracer Tape: A detectable tracer tape shall be placed over the entire length of water main installed. The tape shall have a minimum width of two inches (2") and a materialized foil core. The tape shall be inert and made of bonded layer plastic. The tape shall be blue in color in conforming to the APWA Uniform Color Code. The tape shall have high contrast lettering, a minimum of one-and-one-quarter inches (1-1/4") in height, warning of the buried water line and have the warning repeated every 24 inches.

5. Detectable Tracer Wire: A tracer wire adequate for future location of the pipe suitable for direct bury applications shall be installed with all plastic pipe projects. Tracer wire for directional drilling/boring shall be #12 AWG (0.0808" diameter hard drawn, high carbon 1055 grade steel, solid extra-high-strength copper-clad steel conductor (EHS-CCS) rated at 30 volts, insulated with a 45 mil, high-density, high molecular weight polyethylene (HDPE) insulation rated for direct burial use at 600 volts. EHS-CCS conductor must be at 21% conductivity for locate purposes. Break load of 1150 lbs. HDPE insulation shall be RoHS compliant and utilize virgin grade material. The insulation color shall meet the APWA color code standard for identification of water main. Manufacturers supplying copper-clad steel tracer wire must have available detailed performance data including 5 years of underground testing in terms of durability related to damage of protective insulation and effects of potential corrosion of the specific copper-clad steel used.

Water Service Lines

1. The CONTRACTOR shall provide water service lines for all parcels currently receiving water service from the water main being replaced. Water services will be located by the Township.
2. All taps to be done "live."
3. Distance between taps shall be at a minimum of two feet (2').
4. A minimum clearance distance of two feet (2') shall be maintained between a tap and a pipe joint.
5. For copper services, provide adequate "Goose Neck" at the water main connection. Tap to be made at 10:00 or 2:00 positions.
6. Maintain a minimum of four-to-six feet (4-6') for depth of bury on all service lines.
7. All service fittings shall be of brass, copper or bronze construction, Mueller, Ford or equivalent.
8. One-inch (1") and two-inch (2") service lines shall require "minimum static pressure test" at time of installation. The service lines shall be flushed by CONTRACTOR immediately after installation in accordance with AWWA 810. Instructions from AWWA 810 for post-construction procedures will be provided to residents by the Township DPW, and coordinated by the CONTRACTOR.
9. All water service lines three inches (3") or larger shall be Ductile Iron Class 54, ANSI, A21.51 or as approved by the ENGINEER.
10. All water service lines two inches (2") or less shall be K-copper or as approved by the ENGINEER.
11. There shall be no half-size water service lines allowed.
12. Full lengths of K-copper shall be used. No splicing of short pieces, compression or flare fittings, or couplers will be allowed.
13. For mechanical joint connections, a saddle clamp that is approved for the type of pipe must be used.
14. The saddle clamp must be bronze or stainless steel and with double strap. Single strap clamps will not be allowed.
15. When using PVC pressure pipe the saddle clamp shall be a Ford brass saddle style 202BC with stainless steel band and bolts or approved equal.
16. When using HDPE Pipe, the saddle clamp shall be an electrofusion topping tee on service saddle with a two inches (2") FIP brass straight thread outlet, and a Ford brass coupling, or approved equal, for the size of service indicated on the plans. For service lines greater than two inches (2"), the CONTRACTOR must use side wall fusion, butt-fusion, or electrofusion, tapping method as approved by the ENGINEER and per the pipe manufacturer's recommendation. No mechanical clamps or couplings will be permitted when tapping HDPE Pipe.
17. All lead service lines shall be reported to the Township DPW in a timely manner. Lead service lines cannot be reconnected until a full replacement from the water main to the home (at least 18 inches inside, or to the first shutoff valve) is complete. Partial replacement is not permitted. All lead must be removed from the line prior to returning the line to service.
18. Replacement of lead service lines must meet the requirements of R 325.10604f(6). This includes notification to residents not less than 45 days before the replacement per (6)(e)(i). This notification shall explain the potential for temporary increase of lead levels and steps they can take to minimize their exposure. The Township will be responsible for preparing and delivering the notifications to residents. The CONTRACTOR will be responsible for

coordinating with Township staff to determine construction schedule and ensure that notices are delivered with enough notice prior to construction**. The CONTRACTOR is responsible for scheduling work with the homeowners.**

Fittings

All fittings shall conform to the ANSI/AWWA C110/A21.10-87.

Construction Method

Excavation and Bedding

1. All excavation and bedding work shall be completed as described in the Earthwork Specifications.
2. Prior to the installation of any water main piping or materials, the CONTRACTOR shall examine all trenches and other excavations for the proper grades, lines, levels and clearances required to receive the new work.
3. The CONTRACTOR shall ascertain that all excavation bottoms, compacted subgrades and pipe bedding are adequate to receive water main materials to be installed.
4. The CONTRACTOR shall correct all defects and deficiencies before proceeding with the work.

Existing Water Mains

1. The CONTRACTOR shall expose the existing water main piping and structures to which the new work is to be connected and notify the ENGINEER of the same.
2. The ENGINEER will verify the vertical and horizontal locations of the existing system and shall inform the CONTRACTOR as to the necessary adjustments required to align the new water main with the existing system.

Pipe Ends

1. The CONTRACTOR shall remove all lumps, blisters, excess coatings from the socket and plain ends of pipe.
2. The CONTRACTOR shall wire brush and wipe clean the outside surfaces of all plain ends and the inside surfaces of all socket ends before installation.
3. Any pipe or fitting that has acquired a coating of mud or other adhesive foreign material shall be scrubbed clean with heavily chlorinated water.

Examination of Materials

1. All pipe fittings, valves, hydrants, accessories and appurtenances shall be examined carefully for damage and other defects immediately before installation.
2. Defective or damaged materials shall be marked and held for inspection by the ENGINEER. Damaged materials are subject to rejection by the ENGINEER.

Pipe Cleanliness

1. Foreign matter shall be prevented from entering the pipe while it is being place in the trench.
2. During and after laying operations, no debris, clothing or other materials shall be placed in the pipe.

Pipe Plugs

1. During the progress of all water main work, watertight plugs shall be carried along and inserted in the end of each page as it is laid to prevent foreign matter or rodents from entering the pipe.

2. This watertight plug shall be fastened in the end of the water main in such a manner as to prevent it from floating or being otherwise displaced whenever construction operations are temporarily halted, such as at noon or at the end of the day's work.

Pipe Bearing

Each section of pipe, when placed to grade and line, shall have firm bearing on the trench bedding throughout its length between bell holes.

Pipe Cutting

1. Cutting of pipe shall be done with approved tools and by approved methods suitable for the pipe materials.
2. Pipe cutting methods that produce a smooth, square-cut end without damage to the pipe and that minimize airborne particles shall be employed.
3. Pipe cutting shall be performed using the recommendations of the manufacturer of the type of pipe materials being cut and according to the best trade practices.

Pipe Linings and Coatings

1. When cutting pipe or fittings, care shall be taken to prevent damage to linings and coatings.
2. Damage to linings shall be cause for rejection of the complete section.
3. Damage to exterior coatings shall be corrected to original Specifications.

Gaskets

Where pipe (using a resilient gasket to effect the seal) is cut, the cut pipe end shall be tapered at a 30-degree angle with the centerline of the pipe and ground smooth at the outside end to remove any sharp edges or burrs which might damage the gasket.

Pipe Laying

1. Unless otherwise specified, pipe shall be laid with bell ends facing in the direction of laying.
2. After a length of pipe is placed in the trench, the spigot shall be centered in the bell end of the adjacent pipe section, the pipe shoved into position and brought to true alignment and secured with Class II sand tamped under and on both sides of the pipe except at bell hole.
3. Adequate support shall be provided for all water main pipe.
4. The minimum burial depth for water main shall be 5' from the finished grade.
5. There shall be a minimum of 10' horizontal separation from the outside edge of the pipe to the outside edge of any non-potable utility pipe. There shall be a minimum of 18" vertical separation from the outer edge of pipes at crossing locations. For crossings, one standard stick of pipe is to be centered at the crossing so that joints are as far from the crossing as possible.
6. Where HDPE will be installed via pipe bursting or directional drill, it will be the contractor's responsibility to verify 10' horizontal and 18" vertical clearance is maintained. If not, open-cut will be required.

Pipe Bedding

1. After the bottom of trench has been excavated and filled to the required grade with four inches (4") of Class I sand thoroughly compacted by tamping.
2. The pipe shall be installed strictly in accordance with the manufacturer's recommendations, AWWA C600 for DI, C605 for PVC, and manual M55 for HDPE.

3. After the pipe is laid, the Class II sand backfill shall be continued to a point 12 inches above the top of pipe barrel.
4. Particular care shall be taken to assure filling and tamping all spaces under, around and above the top of the pipe.
5. Backfill shall be as indicated on the plans and in the Specifications.
6. A continuous and uniform bedding shall be provided in the trench for all buried pipe.

Tapping Sleeves or Cut-In Tees

1. Tapping sleeve and Cut-In Tee bolts shall be stainless steel and shall conform to the current Water Department Standards.
2. Where A.C. pipe is being tapped, CONTRACTOR shall use DIWM inside and two feet (2') outside of gate valve and well.

Ductile Iron Pipe

1. Push-On Joints (AWWA Standards C110 & C111) — Joints shall be made by means of a compression-type push-on resilient gasket. Gasket shall be pre-lubricated before installation using a lubricant recommended by the pipe manufacturer. The seated joint shall be identified by the visible mark on the spigot of the installed pipe section. When the temperature is above 60 degrees Fahrenheit, the spigot end of each pipe shall be forced tightly on the bell of the proceeding pipe. When the temperature is below 60 degrees Fahrenheit, the pipe shall be laid with the spigot end one-sixteenth inch (1/16") from the face of the bell for expansion.

2. Mechanical Joints (AWWA Standards C110, C111, & C153) — Joints shall be made with cor-blue T-bolts, molded resilient gasket and cast iron follower gland. All nuts shall be finger tight before using a wrench. The gland and rubber gasket shall be brought up evenly at all points around the bell flange and then torqued per the manufacturer's recommendations. The normal range of bolt torques to be applied to standard cast iron bolts in a joint and the lengths of wrenches that should satisfactorily produce the ranges of torques are as follows:

Bolt Size	Range of Torque	Length of Wrench
5/8 inches	40-60 ft. lb.	8 inches
¾ inches	60-90 ft. lb.	10 inches
1 inch	70-100 ft. lb.	12 inches

3. Flexible Joint Pipe (AWWA Standards C111) — Flexible joint pipe shall be assembled, handled and installed in accordance with the printed recommendations, which accompany

the pipe and provided by the manufacturer of the piping materials being installed. Methods of handling and installation shall be acceptable to the ENGINEER.

Fittings, Strappings and Lugged Pipe

1. Fittings — Install all fittings to the lines, levels and locations indicated on the plans. Installation of fittings shall be with the type of joint specified for piping. Fittings shall be provided with restraints as specified herein, as indicated on the plans and as required for a functional installation.

2. Strapping of Pipe Bends and Fittings — Where indicated on the plans and as directed by the ENGINEER, bends in watermain piping and piping runs subject to impact shall be secured by means of metal strapping. Install all necessary bends, tie rods, nuts and washers required. No metal strapping shall be used in direct contract with asbestos-cement or polyvinyl chloride (PVC) pipe. Where lugged pipe and special fittings are indicated on the plans, furnish and install all necessary tie rods, nuts and washers.

3. All fittings shall be manufactured in the United States. Fittings not meeting this requirement will be removed from the site.

4. All restrained joints shall be Mega-Lugs as manufactured by Ebaa Iron. In addition to the Mega-Lugs all bends, tees, fire hydrants, etc. shall have thrust blocks placed behind each fitting.

Thrust Blocks:
Refer to the Township Water Main Standard Detail Sheets.

Anchors, Encasements and Restraints

1. Plugs, tees, sleeves, bends, caps, straps and lug piping shall be provided with suitable anchors, encasements and restraints as indicated on the plans.
2. Anchoring, encasement and restraint methods shall be as detailed. All bearings shall be as shown.
3. Anchors, encasements and restraints shall rest on firm, stable, compacted subgrade and shall be provided for all standard and special fittings.

Quality Control Testing

1. Hydrostatic Testing — After the pipe has been laid and backfilled, the pipe shall be hydrostatically tested for leakage. All leakage and pressure testing shall be conducted in accordance with current AWWA Standard C600 for Ductile Iron Pipe, C605 for PVC, and ASTM F2164 for HDPE.

   The CONTRACTOR shall be responsible to schedule testing with the ENGINEER, and the Township Department of Public Services.

   The CONTRACTOR shall furnish the pump, pipe connection, hydrants, valves and any other necessary apparatus, including gages and meters and all personnel necessary for conducting the test.

Before applying the test pressure, all air shall be expelled from the pipe. If necessary to accomplish this, taps shall be made at points of higher elevation and afterwards plugged.

The test shall be made at a pressure of 150 pounds per square inch gage and full pressure shall be held for at least two (2) hours.

Any faulty pipe fitting, gate valves or other accessories that permit leaks during testing shall be replaced by the CONTRACTOR with sound material, and the test shall be repeated until specified requirements are met.

The maximum permissible leakage measured by water meter from the section of main tested under pressure shall not exceed a rate of 0.88 U.S. gallons per inch diameter of main per mile of pipe in a two (2) hour period of each section tested. For fused PVC and HDPE pipe the allowable leakage shall be zero.

Test sections will normally not exceed 1,000 feet; in the event more than 1,000 feet of water main is tested, the permissible leakage will remain at the amount determined for 1,000 feet of pipe.

Water for testing shall be obtained from a potable water supply. The CONTRACTOR shall provide all water required at his own expense and shall make all necessary arrangements with the authority, which controls the source of water system and shall be governed in his use of water by said authority. Backflow prevention devices shall be used in accordance with the current rules of regulation.

For private water main, the pressure testing shall follow the same rules and regulations of the public water main pressure testing. Tests to be performed in the presence of the ENGINEER.

The CONTRACTOR shall provide and remove temporary connections between the source water system and the mains constructed under this contract.

For HDPE pipe, the testing shall be in accordance with the current ASTM F2164 Standard and the guidelines and procedures taken from PPI Technical Report TN-46/2013a. For fused HDPE pipe the allowable leakage shall be zero.

2. Water for Testing — All temporary connections shall meet with the approval of the ENGINEER, the authority controlling the source water system and public health authorities having jurisdiction.

Cleaning and Disinfection (C651 & C655)

1. Flushing — After completion of watermain installation, the CONTRACTOR shall provide adequate flushing equipment and shall flush the new mains, valves, hydrants and appurtenances completely and as acceptable to the ENGINEER. The minimum flushing velocity shall be 3 ft/s.

Heavily chlorinated water discharged from a disinfected system shall be controlled adequately to protect any surface water resource or adjacent property from potential environmental damage or from creation of a hazard to traffic.

The CONTRACTOR shall remove and dispose of all equipment and materials that create a hazard to traffic. The CONTRACTOR shall remove and dispose of all temporary installations at completion of the flushing operation.

2. Disinfection — After satisfactory hydrostatic testing and flushing of the new watermain, disinfect the complete system by introduction of chlorine-water solution throughout the watermain piping. This must conform to AWWA C651 standards for disinfection of watermain.

The liquid mixture shall be applied by means of a solution-feed chlorinating (continuous Feed Method) of the main or valve section thereof.

A slow flow of water shall be let into the main approximately at the point of injection of the chlorine solution at a rate such that the chlorine dosage of the entering water shall be at least 25 parts per million (ppm).

An open dosage discharge shall be maintained at the far end of the section of main being chlorinated and the introduction of chlorine solution and water shall continue until the water discharging at the far end shall carry the required dosage of chlorine.

As the main is filled with chlorinated water, each outlet from the main shall be opened and sufficient water drawn off to assure that the full dosage of chlorine reaches each outlet.

Back pressure causing a reversal of flow in the main being chlorinated shall be prevented and pressure in the main shall be held down to a point which will make it impossible for chlorinated water to be forced into other sections of the main or water system.

The chlorine treated water shall remain in the main at least 24 hours, and at the end of that time the chlorine residual at pipe extremities and other representative points shall be at least 10 ppm. If the chlorine residual shall be less than 10 ppm at the end of the 24 hours, further application of chlorine shall be made and the retention period repeated until the required 10 ppm residual is obtained. For HDPE pipe the solutions should not exceed 12% active chlorine to prevent degradation of pipe.

Should the initial treatment of all or any section of the mains, in the opinion of the ENGINEER, prove ineffective, the chlorination procedure shall be repeated until confirmed tests show that water sampled from the new mains conforms to the foregoing requirements.

The CONTRACTOR shall be responsible to schedule with the ENGINEER and the Township Water and Sewer Department the collection of water samples and causes analyses to be made at his own expense.

3. Water for Cleaning and Disinfection — Water for cleaning and disinfection shall be obtained from a potable water supply.

   The CONTRACTOR shall provide all water required at his own expense and shall make all necessary arrangements with the authority which controls the source of water system and shall be governed in his use of water by all rules and regulations imposed thereon by said authority.

   The CONTRACTOR shall provide and remove temporary connections between the source water system and the mains constructed under this contract.

   All temporary connections shall meet the approval of the ENGINEER, the authority controlling the source water system and public health authorities having jurisdiction.

4. Bacteriological Analysis — Prior to placing a watermain in service, not less than two (2) consecutive water samples in a 24-hour period for bacteriological analysis shall be collected and each analysis shall show results meeting state drinking water standards. Samples must be collected every 1,000 feet of new watermain, in additional to collecting samples from each branch and the end of the line. Only state certified labs are to be used.

   The CONTRACTOR shall be responsible to schedule the collection of water samples and cause analyses to be made at his own expense. **The Township or ENGINEER do not collect and/or test the water samples.**

   For private watermains, a state certified lab shall follow the same rules and regulations for public watermain bacteriological analysis in the presence of the ENGINEER.

   A new set of bacteriological analysis shall be required if the tie-in to Township watermain is not completed within 96 hours of obtaining the successful results of the bacteriological analysis.

Pipe Boring and Jacking

Sheeting, Shoring and Bracing

1. Furnish, install and maintain throughout the progress of the work such sheeting, shoring and bracing in tunnels, shafts and trenches as may be required for safety of workmen, for protection of the work and adjacent structures, and for issuance of applicable agency permits. All sheeting, shoring, bracing shall be removed after completion of the work unless otherwise indicated on the plans or directed by the ENGINEER. Design of earth supports shall be the responsibility of the CONTRACTOR and shall be as required by the nature of the soils encountered. Supports shall be dimensioned and spaced as to prevent caving, loss of earth or squeezing within the

neat lines of the excavation. Supports shall effectively restrain movement of the adjacent soil.

2. Pretunneled Excavation — Perform pretunneled boring or augering excavation by excavating an opening larger than the outside diameter of the pipe to be installed. The diameter of the excavation shall not exceed the outside diameter of the pipe by more than one inch (1”).
3. Jacking Excavation — Construct excavation for jacked-in-place pipe by excavating ahead of the pipe approximately one inch (1”) larger than the outside diameter of the pipe at the top and tapering off towards the invert. Perform excavation from inside the pipe. The excavation shall not be carried ahead of the pipe to a distance, which will cause caving of the earth. For unstable ground, the pipe shall precede the auger or earth-cutting equipment. In no case shall excavations proceed more than 12 inches ahead of the pipe-cutting edge. If the above excavation tolerances cannot be met by the CONTRACTOR, jacking excavations shall not proceed ahead of the pipe-cutting edge. Attach a steel cutting edge or shield to the front section of the lead pipe to form or cut the required opening, if necessary. The use of water or other liquids to facilitate placing of pipe or removal of spoil material is prohibited.

Casing or Casing/Carrier Pipe Installation

1. General: Use the types and sizes shown on the plans or specified herein. Place pipe to the lines and grades indicated on the plans. Use care to not damage pipe, joints or joint material. Use plywood or other protective joint spacer material to distribute pushing or pulling leads evenly around joints. Completely fill voids between outside well and soil as specified.
2. Pretunneled Installation: Install pipe in pretunneled excavations as shown on the plans. Use care to not disturb or cause caving of the excavation.
3. Jacked Installation: Install pipe in jacked excavation as indicated on the plans. Closely follow mining operations. Insofar as possible, use continuous operations, extending through weekends and holidays, until the work is completed to guard against pipe freeze-up due to settlement or compaction of surrounding soil. If necessary, use bentonite lubricant applied under pressure through fittings in the lead pipe to reduce pipe-soil friction. Use no less than two (2) jacks of sufficient power to carefully and accurately install the pipe by pushing or jacking pressure. Use a timber bearing pushing frame, built to fit and match the end of the pipe being jacked, to evenly distribute the jacking force over the end of the pipe. Use reaction blocks or backstop supports, installed in the jacking pit, shaft or trench, of sufficient strength to handle the thrust of the jacks.

Carrier Pipe Installation

Install carrier pipe within pipe as indicated on plans. Use plastic spacers (RACI casing spacers or approved equal).

Bulkheading

1. Provide cast-in-place or concrete masonry unit bulkheads where indicated on the plans, as specified herein, or as required by the ENGINEER. Bulkheading shall be of the types and sizes indicated. When boring and jacking under railroad rights-of-way, provide temporary bulkheading of headings at the end of each boring operation. When boring and jacking under railroad rights-of-way, provide

temporary bulkheading or headings if the work is shut down for a period exceeding eight (8) hours.

2. Provide temporary bulkheading of headings where soil conditions require such additional protection for shorter shut-down periods as directed by the ENGINEER.

Backfilling

1. Casing and Casing/Carrier Pipe: Excavations beyond the neat lines of the pipe shall be backfilled with a sand-cement or grout mixture. Any voids judged by the ENGINEER to exist behind such construction under a road, railroad or public utility, or under or adjacent to any structure shall be done within 24 hours. If, as determined by the ENGINEER, ground or other conditions warrant, backfilling shall be done immediately.

For tamped backfill, fill all voids with sand-cement mixture consisting of one (1) part Portland cement to not more than 10 parts fine aggregate, by volume, tamped thoroughly in place.

For pressure-grouted backfill, fill all voids with a grout mixture consisting of one (1) part Portland cement to three parts fine aggregate by volume with sufficient water to flow through the grouting pipes. Install grout mixture under pressure from the pipe interior through threaded grout holes in pairs every 16 feet piecing the pipe wall or from the ground surface through insertion pipes.

For 30-inch diameter and larger pipes placed in pretunneled excavation, use tamped or pressure-grouted backfill. For less than 30-inch diameter pipe placed in pretunneled excavation and all jacked pipe installations, use pressure-grouted backfill.

2. Carrier Pipe: After successful testing of the carrier pipe, backfill the remaining space between the carrier pipe and casing pipe as indicated on the plans required by the appropriate government or private agency having jurisdiction as directed by the ENGINEER. If backfill is required, use pea gravel or sand blown into the open spaced, unless otherwise required. Brace carrier pipe adequately to prevent floating or movement during backfilling. Plug ends of casing pipe as detailed on the plans.

3. Jacking Pit/Approach Trench/Shaft: After the casing and carrier pipe have been installed and approved by the ENGINEER, the CONTRACTOR shall backfill the jacking pits, approach trenches or shafts. The jacking pits, approach trenches or shafts shall be considered as open cut trench and where they exceed the maximum allowable trench width, the carrier pipe shall be backfilled as specified in the Township of Brownstown Standard Specifications.

SPECIFICATIONS FOR
HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS

PART 1 – GENERAL

1.01 DESCRIPTION

A. SCOPE

1. This section specifies high density polyethylene (HDPE) pipe and fittings, including acceptable fusion technique and practice, and safe handling and storage.

B. PIPE DESCRIPTION

1. Pipe Supplier shall furnish high density polyethylene (HDPE) pipe and fittings conforming to all applicable standards and procedures as referenced in this specification, and meeting all applicable testing and material properties as described by the applicable standards referenced in this specification or as required within this specification.

1.02 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to the following documents. They are a part of this section to the extent referenced in this specification. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of a conflict between the requirements of this section and those of the referenced documents, the requirements of this specification shall prevail.

2. Unless otherwise specified, references to documents shall mean the latest published edition of the referenced document in effect at the time of construction.

Reference	Title
AWWA C651	Standard for Disinfecting Water Mains
ANSI/AWWA C901	Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13 mm) Through 3 In. (76 mm) for Water Service
ANSI/AWWA C906	Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,600 mm), for Water Distribution and Transmission
ASTM C923	Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
AWWA M55	Manual of Water Supply Practices, PE Pipe–Design and Installation
ASTM D1603	Standard Test Method for Carbon Black in Olefin Plastics
ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D2774	Standard Practice for Underground Installation of Thermoplastic Pressure Piping

Reference	Title
ASTM D3035	Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
ASTM D3261	Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
ASTM D4218	Standard Test method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
ASTM F585	Standard Practice for Insertion of Flexible Polyethylene Pipe Into Existing Sewers
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
ASTM F1055	Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing
ASTM F1290	Standard Practice for Electrofusion Joining Polyolefin Pipe and Fittings
ASTM F1417	Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
ASTM F1962	Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings
ASTM F2164	Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure
ASTM F2206	Standard Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE) Plastic Pipe, Fittings, Sheet Stock, Plate Stock, or Block Stock
ASTM F2620	Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
ASTM F2786	Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Gaseous Media Under Pressure (Pneumatic Leak Testing)
NSF 14	Plastic Piping System Components and Related Materials
NSF 61	Drinking Water System Components-Health Effects
PPI TR-4	PPI Listing of Hydrostatic Design Basis (HDB), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength Ratings for Thermoplastic Piping Materials for Pipe
PPI TR-46	Guidelines for Use of Mini-Horizontal Directional Drilling for Placement of High Density Polyethylene Pipe

B. MANUFACTURER REQUIREMENTS

1. High density polyethylene (HDPE) pipe and fittings shall be manufactured in accordance with the following standards

   a. ASTM D3035 – ½ in through 24-in pipe

   b. ASTM F714 – 3-in through 54-in pipe

c. AWWA C901 – 1/2 In. (130mm) through 3 In. (76 mm) pipe and tubing

d. AWWA C906 – 4 In. (100 mm) through 63 In (1,600 mm) pipe and fabricated fittings

e. ASTM D3261 – butt fusion fittings, saddles and flange adapters

f. ASTM F1055 – electrofusion couplings and saddles.

g. ASTM F2206 – fabricated fittings

C. FUSION TECHNICIAN REQUIREMENTS

1. Each Fusion Technician shall be separately qualified to make each type of fusion joint. Fusion joint types are butt fusion, saddle fusion and electrofusion. Qualification to make one type of fusion joint shall not qualify a Fusion Technician to make a different type of fusion joint.

2. Each Fusion Technician making butt fusion joints shall be qualified to make butt fusion joints in accordance with ASTM F2620. Qualification shall have occurred not more than 12 months before performing fusion joining on site in accordance with this specification. Qualification shall be a documented demonstration of proficiency by making joints in accordance with ASTM F2620 that are proved to be satisfactory by destructive testing in accordance with ASTM F2620.

3. Each Fusion Technician making saddle fusion joints shall be qualified to make saddle fusion joints in accordance with ASTM F2620. Qualification shall have occurred not more than 12 months before performing on-site fusion joining in accordance with this specification. Qualification shall be a documented demonstration of proficiency by making joints in accordance with ASTM F2620 that are proved to be satisfactory by destructive testing in accordance with ASTM F2620.

4. Each Fusion Technician making electrofusion fitting joints shall be qualified to make electrofusion fitting joints in accordance with ASTM F1290 and the electrofusion fitting manufacturer's recommended procedure. Qualification shall have occurred not more than 12 months before performing on-site fusion joining in accordance with this specification. Qualification shall be a documented demonstration of proficiency by making joints in accordance with ASTM F1290 and the electrofusion fitting manufacturer's recommended procedure that are proved to be satisfactory by destructive testing in accordance with ASTM F1290 and the electrofusion fitting manufacturer's recommended procedure.

D. WARRANTY

1. Pipe and fitting suppliers shall provide a one-year warranty covering defects in product material and workmanship. A successful pressure test or pressure leak test prior to the expiration of the warranty period shall not relieve the supplier of warranty responsibility for the full warranty term.

2. Fusion providers shall provide a one-year warranty from the date of installation acceptance covering defects in fusion joining workmanship that shall provide for remaking defective butt fusion, saddle fusion or electrofusion joints. A successful pressure test or pressure leak test prior to the expiration of the warranty period shall not relieve the installer of warranty responsibility for the full warranty term.

E. SUBMITTALS

1. The following information shall be submitted by pipe and fitting suppliers:
    a. Name of the pipe manufacturer and a list of the piping and quantities to be provided by manufacturer.
    b. Name(s) of fitting manufacturer(s) and lists of fittings and quantities to be provided by manufacturer.
    c. Pipe and fitting product data indicating conformance with this specification, applicable standards, and warranty provisions, including written documentation regarding any intended variance from this specification and applicable standards.
    d. At the time of shipment, the supplier shall provide certified documentation of pipe and fitting conformance with this specification and applicable pipe and fitting standards specified herein.
2. The following information shall be submitted by Fusion Providers.
    a. Documentation that each Fusion Technician has met requirements for joining proficiency for each type of fusion joint performed by the Fusion Technician under this specification.
    b. Documentation of conformance with this specification and applicable standards, including written documentation regarding any intended variance from this specification and applicable standards. This will include fusion joint warranty information and recommended project specific fusion parameters, including criteria logged and recorded by data logger.
    c. The following AS-RECORDED DATA is required from the Contractor and/or Fusion Provider:
        1) Fusion reports for each fusion joint performed on the project, including joints that were rejected. Submittals of the Fusion Technician's joint reports are required as requested by the Owner or Engineer. Specific requirements of the Fusion Technician's joint report shall include:
            (a) Pipe or fitting size and DR or pressure class rating
            (b) Fusion equipment size and identification
            (c) Fusion Technician Identification
            (d) Job Identification Number

(e) Fusion Number

(f) Fusion joining parameters

(g) Ambient Temperature

PART 2 – PRODUCTS

2.01 PIPE AND FITTINGS FOR PRESSURE POTABLE WATER SERVICE

A. PE4710 pipe and fitting material (compound):

1. PE4710 material (compound) shall conform to material requirements specified in: ASTM D3035 or ASTM D3261 as applicable for the pipe or fitting. PE4710 material shall meet the requirements of ASTM D3350 and shall meet or exceed a cell classification of 445574 per ASTM D3350.

2. PE4710 material compound shall have a hydrostatic design stress (HDS) rating for water at 73°F (23°C) of not less than 1000 psi that shall be listed in PPI TR-4 in the name of the pipe manufacturer.

3. PE4710 material compound shall have a hydrostatic design basis (HDB) rating at 140°F (60°C) of not less than 1000 psi that shall be listed in PPI TR-4 in the name of the pipe manufacturer.

4. PE4710 pipe and fitting material compound in PE4710 pipe and fittings shall contain color and ultraviolet (UV) stabilizer meeting the requirements of Code C or E per ASTM D3350. Code C material shall contain 2 to 3 percent carbon black to provide indefinite protection against UV degradation when material from the pipe is tested in accordance with ASTM D1603 or ASTM D4218. Code E material used for coextruded OD color stripes or a coextruded ID color layer shall contain sufficient UV stabilizer to protect the pipe against UV degradation for at least 24 months of unprotected outdoor exposure. Coextruded color PE compound material shall be PE4710 pipe material compound, varying only by color and UV stabilizer.

5. PE4710 pipe and fittings for portable water applications shall contain an Oxidative Resistance Classification in accordance to ASTM D3350-14 Table 2, Part 6.8.

6. Clean rework materials derived from pipe production by the same manufacturer are acceptable as part of a blend with new material for the production of new pipe provided that the rework material is the same PE4710 material designation as the new material compound to which it is added. Finished products containing rework material shall meet the requirements this specification.

7. *Qualification for potable water service.* PE4710 compounds shall be tested and certified as suitable for use with potable water in accordance with NSF 14 & 61.

B. PE4710 pipe and butt fusion fittings shall have plain ends for butt fusion.

C. PE4710 pipe

1. Nominal straight lengths of 3 inch and larger pipe shall be 40 ft. or 50 ft.
2. Nominal coil lengths of 4-inch and smaller pipe shall be 500 ft. Longer or shorter coils such as 800 ft for 4-inch pipe, 1000 ft for 3-inch pipe, or 2000 ft for 2 inch or smaller pipe shall be acceptable.
3. Pipe shall be blue shell or lined on the exterior and black on the inside.
4. Pipe shall be permanently marked using heated indent printing including:
    a. Nominal size and sizing system, e.g., IPS or DIPS
    b. DR or SDR
    c. Standard Designation, ASTM D3035, material designation, and pressure rating or pressure class for water at 73°F.
        1) Marking the Standard Designation on the pipe shall serve as the manufacturer's certification that the pipe has been manufactured, sampled and tested and has been found to comply with the requirements of the standard.
        2) The ASTM D3035 or ASTM F714 pipe pressure rating for water at 73°F shall be "PE4710 PR200 or PC200", DR-11 = Minimum 200 PSI pressure rating
        3) The AWWA C906 pipe pressure class for water at 73°F shall be "PE4710 PC200[1]" where 200 = pressure class in psi.
    d. Pipe shall be third party certified to meet NSF 14 & 61 and the exterior of the pipe shall bear the stamp signifying the third party certification. Pipe not marked as indicated above will be rejected.
    e. Extrusion production-record code
    f. Manufacturer's Trademark or trade name shall be marked on the pipe.

D. PE4710 fittings

1. PE4710 butt fusion, saddle fusion, electrofusion and fabricated fittings shall be manufactured from PE4710 material (compound) in accordance with this specification.
2. PE4710 fittings shall comply with ASTM D3261 for molded butt fusion and saddle fusion fittings, flange adapters and MJ adapters, or shall comply with ASTM F2206 for fabricated butt fusion fittings, or shall comply with ASTM F1055 for electrofusion fittings.
3. PE4710 fittings shall comply with the marking requirements of ASTM D3261 for molded butt and saddle fusion fittings, flange adapters and MJ adapters or shall comply with the

[1] Per AWWA C906, PE3408 marking and PE3408 PCXXX is required. Pipe may be manufactured using PE4710 material (compound) that is listed in PPI TR-4 as meeting PE3408 requirements.

marking requirements of ASTM F2206 for fabricated butt fusion fittings, or shall comply with the marking requirements of ASTM F1055 for electrofusion fittings.

a. Marking shall include the NSF 14 & 61 mark verifying suitability for potable water service.

4. PE4710 fittings shall have pressure class ratings not less than the pressure class rating of the pipe to which they are joined.

2.02 FUSION JOINTS

A. Unless otherwise specified, PE4710 pipe and fittings shall be assembled in the field with butt fusion, saddle fusion or electrofusion joints. ASTM F2620 and the pipe manufacturer's recommended procedure shall be observed for butt fusion and saddle fusion joints. ASTM F1290 and the electrofusion fitting manufacturer's recommended joining procedure shall be observed for electrofusion joints.

B. Field butt fusion, saddle fusion and electrofusion joints shall be made by Fusion Technicians that are qualified in accordance with this specification to make the specific fusion joint type.

C. Field fusion joints shall be recorded and documented in accordance with this specification.

2.03 CONNECTIONS AND FITTINGS FOR PRESSURE APPLICATIONS

A. Connections shall be defined in conjunction with the linking of project piping, as well as the tie-ins to other piping systems.

B. MECHANICAL FITTINGS

1. Acceptable mechanical fittings for use with PE4710 pipe and fittings shall be mechanical fittings that are qualified by the mechanical fitting manufacturer for use with HDPE pipe and fittings.

2. Mechanical fittings for use with HDPE pipe shall provide restraint against longitudinal separation that is inherent to the design of the joint. Mechanical joints that do not provide restraint against pull-out or push-off are prohibited.

3. Mechanical connections to non-HDPE devices and appurtenances shall be by bolted flange adapter or MJ adapter. Flange adapter and MJ adapter connections shall be assembled, installed and tightened in accordance with flange adapter or MJ adapter manufacturer's instructions. Flange bolt tightening shall be in accordance with PPI TN-38.

C. GASKETED, PUSH-ON FITTINGS

1. Gasketed push-on fittings shall be fitted with external mechanical restraints that span across the joint and are assembled in accordance with restraint manufacturer's instructions.

a. Thrust blocking does not provide acceptable restraint and is prohibited.

b. Where plain-end PE4710 pipe is assembled with push-on fittings, the PE4710 pipe end shall be fitted with electrofusion restraints so that external mechanical restraint may be secured to the PE4710 pipe.

2. Where PE4710 pipe is connected to gasketed mechanical joint fittings or appurtenances, the connection shall be made by butt fusing a PE4710 MJ Adapter to the PE4710 pipe and connecting the PE4710 MJ Adapter to the mechanical joint fitting or appurtenance.

D. SLEEVE-TYPE COUPLINGS

1. Sleeve-type mechanical couplings shall be manufactured for use with HDPE pipe, and shall be restrained as indicated on the drawings and in these specifications. Unrestrained sleeve-type couplings are prohibited.

E. EXPANSION AND FLEXIBLE COUPLINGS

1. Expansion-type mechanical couplings are prohibited.

F. CONNECTION HARDWARE

1. Bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21.11, regardless of any other protective coating.

PART 3 -- EXECUTION

3.01 DELIVERY AND OFF-LOADING

A. All piping shall be bundled or packaged for transportation by commercial carrier to the site.

B. Before off-loading, pipe shall be inspected for damage. Any pipe damaged in shipment shall be assessed and either accepted or rejected as directed by the Owner or Engineer, and the pipe supplier shall be notified of rejected pipe within 7 days of delivery at the site. Rejected pipe shall be quarantined for disposition. Each pipe shipment shall be checked for quantity and proper pipe size, color and type.

C. Pipe shall be off-loaded and handled in accordance with the pipe manufacturer's instructions and AWWA M55.

3.02 HANDLING AND STORAGE

A. Pipe lengths should be placed and stored on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.

B. Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way. Use of hooks, chains, wire rope or any other handling device which creates the opportunity to damage the surface of the pipe is strictly prohibited.

C. Covering or shading of PE4710 pipe and fittings against exposure to ultraviolet light from sunlight is not required.

3.03 FUSION PROCESS

A. GENERAL

1. Butt and saddle fusion of PE4710 pipe and fittings shall be in accordance with ASTM F2620 and the manufacturer's recommended joining procedure.

2. Electrofusion of PE4710 pipe and fittings shall be performed in accordance with ASTM F1290 and the electrofusion fitting manufacturer's recommended procedure.

3. PE4710 pipe and fittings shall be fused by qualified fusion technicians, as documented by the fusion provider. Training records for qualified fusion technicians shall be available to Owner or Engineer upon request.

4. As each fusion joint is constructed, pressure, time and temperature parameters shall be recorded and logged by an electronic monitoring device (data logger) affixed to the fusion machine. Joint data shall be submitted as part of the As-Recorded information, in accordance with this specification.

5. Butt fusion machines shall incorporate the following properties, including the following elements:

    a. HEAT PLATE – Heat plates and the non-stick coatings on heating surfaces shall be in good condition without heating surface gouges or scratches. The non-stick coating shall be intact, clean and free of any contamination. Heater controls and temperature indicators shall function properly, and electrical cords and connections shall be in good condition. The heat plate shall maintain a uniform and consistent temperature on all areas of the heating surfaces on both sides of the heat plate.

    b. CARRIAGE – Carriage shall travel smoothly with no binding at less than 50 psi for hydraulic fusion machines. Clamps shall be in good condition with proper inserts for the pipe size being fused.

    c. GENERAL MACHINE – Overview of machine body shall yield no obvious defects, missing parts, or potential safety issues during fusion.

    d. DATA LOGGER – The current version of the pipe supplier's recommended and compatible software shall be used. Protective case shall be utilized for the hand held wireless portion of the unit. Data logger operations and maintenance manual shall be with the unit at all times. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life.

6. Other equipment specifically required for fusion processes shall include the following:

    a. Pipe rollers shall be used to support pipe to either side of the butt fusion machine and provide for vertical and lateral pipe alignment straight through the butt fusion machine.

b. A protective enclosure that provides for full machine motion of the clamps, heat plate, fusion assembly and carriage shall be provided for fusion in inclement and/or windy weather. Pipe ends shall be covered or blocked where open pipe ends could allow prevailing winds to blow through the pipe.

c. Fusion machine operations and maintenance manual shall be kept with the fusion machine at all times.

B. JOINT RECORDING

1. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine that shall register and/or record the parameters required by the manufacturer and these specifications. Data not logged by the data logger shall be logged manually and be included in the Fusion Technician's joint report.

3.04 INSTALLATION

A. The PE4710 pipe and fittings shall be installed such that PE4710 pipe curvature is not less than the minimum bending radius recommended by the pipe manufacturer.

B. Direct burial installation of PE4710 pressure pipe shall be in accordance with ASTM D2774 and the pipe manufacturer's recommendations.

C. Direct burial installation of PE4710 non-pressure pipe shall be in accordance with ASTM D2321 and the pipe manufacturer's recommendations.

D. Installation of PE4710 pipe by horizontal directional drilling shall be in accordance with ASTM F1962 or PPI MAB-7 and the pipe manufacturer's recommendations.

E. Installation of PE4710 pipe by sliplining or insertion within a casing or host pipe shall be in accordance with ASTM F585 and the pipe manufacturer's recommendations.

F. Tracer Wire – All PE4710 piping shall be installed with a continuous, insulated TW, THW, THWN, or HMWPE insulated copper, 10 gauge or thicker wire for pipeline location purposes by means of an electronic line tracer.

1. The wires shall be installed along the entire length of the pipe.

2. Sections of wire shall be spliced together using approved splice caps and waterproof seals. Twisting the wires together is not acceptable.

3.05 MAKING CONNECTIONS TO NON-PE4710 PIPING SYSTEMS

A. Approximate locations for non-PE4710 piping systems are shown on the drawings or detailed in the specifications. Prior to making connections into existing piping systems, the Contractor shall:

1. Verify the actual field location, size, piping material and service of non-PE4710 piping systems.

2. Obtain all required non-PE4710 piping manufacturer(s) approved fittings (i.e., saddles, sleeve type couplings, flanges, tees, etc., as shown).

3. Have installed all temporary pumps and/or pipes in accordance with established connection plans.

4. Have on hand pipe stoppers, blind flanges or other devices to seal a valve or appurtenance that fails to seal properly. When applied to pressure rated valves or appurtenances, all such devices shall be pressure rated equal to or greater than the pressure rating of the valve or appurtenance to which they are attached.

B. Where PE4710 pipe connects in-line to unrestrained gasketed push-on piping, the end of the PE4710 pipe shall be anchored in-line within 10 ft of the connection to restrict longitudinal movement of the PE4710 pipe.

1. The PE4710 pipe shall be fitted with a PE4710 wall anchor or electrofusion flex restraints.
2. The PE4710 wall anchor or electrofusion flex restraints shall be encased in reinforced concrete that is sufficient to withstand Poisson effect longitudinal loads in accordance with AWWA M55 In-Line Anchoring.

C. Unless otherwise approved by the Engineer, new piping systems shall be completely assembled and successfully tested prior to making connections to non-PE4710 piping systems.

3.06 PIPE SYSTEM CONNECTIONS

A. Pipe connections shall be installed per applicable standards and regulations, as well as per the connection manufacturer's recommendations and as indicated on the drawings. Pipe connections to structures shall be installed per applicable standards and regulations, as well as per the connection manufacturer's recommendations.

3.07 TRACER WIRE TESTING

A. Upon completion of installation by direct burial, sliplining, directional boring or pipe bursting, the Contractor shall demonstrate that the tracer wire is continuous and unbroken through the entire run of the pipe.

1. Demonstration shall include full signal conductivity (including splices) when energizing for the entire run in the presence of the Owner or Engineer.

2. If the wire is broken, the Contractor shall repair or replace it. Pipeline installation will not be accepted until the tracer wire passes a continuity test.

3.08 TAPPING FOR POTABLE AND NON-POTABLE WATER APPLICATIONS

A. Tapping shall be performed using standard saddle fusion fittings, electrofusion saddle fittings, or mechanical tapping saddles or sleeves designed for use on HDPE piping. Tapping by threading directly into the PE4710 pipe wall is prohibited.

B. Branching connections requiring a larger diameter shall be made with saddle fusion branch saddle fittings or mechanical branch connection fittings as specified and indicated on the drawings.

C. Equipment used for tapping shall be made specifically for tapping HDPE pipe:

1. Tapping bits shall be slotted “shell” style cutters, specifically made for HDPE pipe. ‘Hole saws’ made for cutting wood, steel, ductile iron, or other materials are strictly prohibited.

2. Manually operated or power operated drilling machines may be used.

D. Taps may be performed while the pipeline is filled with water and under pressure (‘wet’ tap), or when the pipeline is not filled with water and not under pressure (‘dry’ tap).

3.09 TESTING

A. Testing shall comply with all local building codes, statutes, standards, local jurisdiction, and laws.

B. Segments of the pipe may be tested separately in accordance with standard testing procedure, as approved by the Owner and Engineer.

C. HYDROSTATIC LEAKAGE TESTING FOR PRESSURE PIPING

1. Hydrostatic leakage testing shall comply with ASTM F2164. Joint leakage and any defective materials and/or workmanship shall be repaired or replaced by the Contractor at no additional cost to the Owner. There shall be no leakage on fused HDPE pipe.

2. Pneumatic (compressed air) leakage testing of PE4710 pressure piping is prohibited.

D. DISINFECTION OF THE PIPELINE FOR POTABLE WATER PIPING

1. After installation, the pipeline, having passed all required testing, shall be disinfected prior to being put into service per AWWA C651. See specifications for water main cleaning and disinfection.

SPECIFICATIONS FOR
HDPE CONTRACTOR FUSION OPERATOR QUALIFICATIONS & REQUIREMENTS

DEFINITIONS AND ACRONYMS

Butt Fusion - A method of joining HDPE pipe where two pipe ends are heated and rapidly brought together under pressure to form a homogeneous bond. It is estimated that at least 90% of the fusions in the HDPE pipe industry are butt fusion welds.

Ductile Iron Pipe Sizing (DIPS) — DIPS is used for HDPE pipe when HDPE pipe is OD controlled. DIPS pipe OD is larger than IPS pipe OD by almost half an inch.

Iron Pipe Sizing Convention (IPS) — IPS is used for HDPE pipe when HDPE pipe is OD controlled. IPS pipe OD is always smaller than DIPS pipe OD.
Example - An 8" DR11 IPS pipe features an 8.6" average OD and a .78" minimum wall with a 7.0" average ID; an 8" DR11 DIPS pipe features a 9.1" average OD and minimum wall of .82" with an average ID of 7.3"

Dimension Ratio (DR) - The ratio of pipe diameter to wall thickness, where DR= outer diameter divided by the minimum wall thickness. DR = OD/tMIN

Electrofusion (EF) — A heat fusion joining process where the heat source is an integral part of the fitting.

High Density Polyethylene (HDPE) or Polyethelyne (PE) — HDPE pipe or fitting.

IPS — Iron Pipe Sizing convention used for PE pipe. HDPE pipe is an OD controlled piping system designed to fit into existing systems, thus IPS and DIPS sizing.

Pressure Rating - Estimated maximum internal pressure allowed with a high certainty that failure of the pipe will not occur. HDPE can handle as a part of its design occasional surges to 2 times its pressure rating and 1.5 times for recurring surges.

Standard Dimension Ratio (SDR) - A specific ratio of the average specified outside diameter to the minimum specified wall thickness for outside diameter- controlled plastic pipe. Common reference is DR. DR and SDR are the same and used interchangeably.

Thermoplastic - A plastic, such as PE, that can be repeatedly softened by heating and hardened by cooling through a temperature range characteristic of the plastic and that in the softened state can be shaped by molding or extrusion.

QUALIFIED HDPE FUSION CONTRACTOR

Contractors shall provide the following documentation for ALL personnel conducting and performing HDPE fusions:

1. Manufacturer training qualification card not older than 24 months.

2. Contracting company history of 2 or more successful projects serving as a prime contractor or subcontractor for similar HDPE fusion and directional-drilling projects within the last 36 months. Provide owner or engineer contact references.

Only qualified technicians or operators with the following training and experience will be permitted to fuse and install HDPE pipe:

a. Proof of qualification within the last 24 months via a manufacturers recognized training facility or program.
b. Documented prior experience in preparing logs, records, markings, installations and testing.
c. Trained in heat fusion procedures according to ASTM F2620 Butt Fusion and ASTM F1055 Electro Fusion.
d. Competent and knowledgeable in heat fusion procedures
e. Trained in accordance for the size of the installation.
f. Understands effects of changing conditions in the surrounding environments and adjusts or checks fusion parameters to avoid negative impacts of the fusions. (ie. weather changes – cold or wet, wind and dust, bend radius, etc.)

FUSION RECORDS AND MARKING

Paper or electronic records of joint fusion procedure details shall be kept for all HDPE pipe fusions and provided to the Engineer. GPS coordinates shall be utilized to identify and pinpoint locations of specific fusions. All fusions regardless of where they are actually fused shall be marked on the pipe for reference.

The permanent type markers, such as the, “Sharpie,” (ie Sharpie brand, permanent silver metallic) and “Magic Marker” by Avery are adequate for marking light colored pipe. Fast drying paint pens, such as PENTEL and Faber Castell, also work well and are available in colors that will show well on black pipe.

These markings shall include:

1. Date/time
2. Operator Name or Company
3. Fusion identification (ID) number assigned (link to data logger)
4. Project Number

An example of the minimum typical information is shown in Figure 1. Follow all guidelines and recommendations provided by data logger manufacturers.

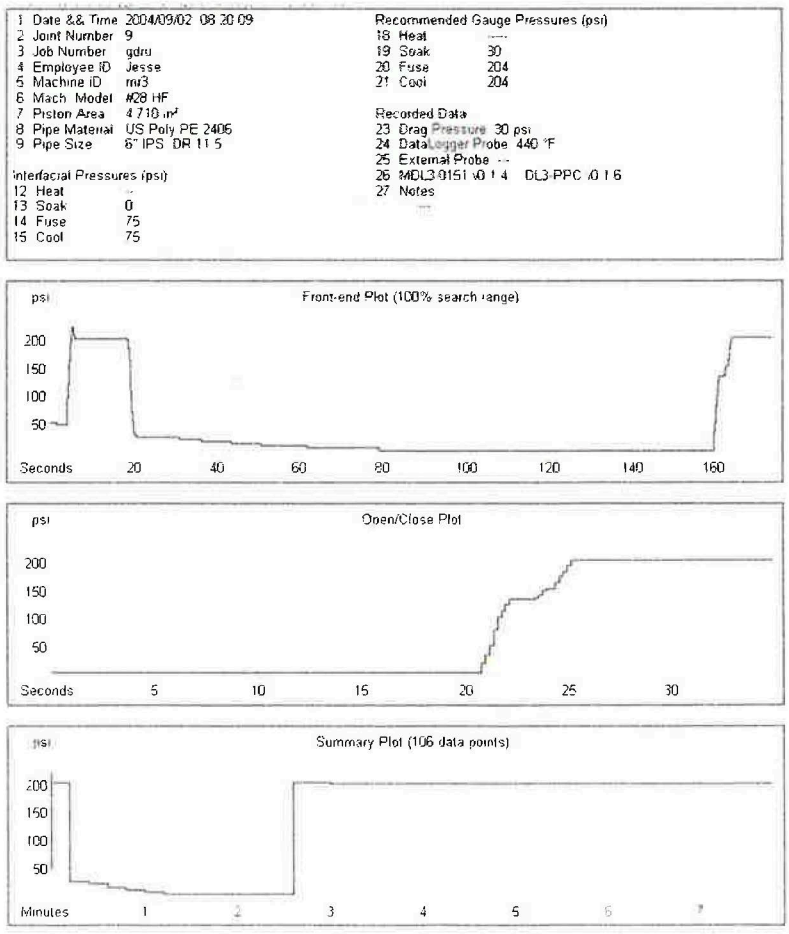

Figure 1. Example of a heat fusion joint record output for a McElroy Data Logger

REFERENCES

American Society for Testing and Materials (ASTM) (2013). Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings (F2620-13~. **ASTM International, West Conshohocken, PA. www.astm.org.**

Colorado Springs Utilities (2014). Water Line Extension and Service Standards. www.csu.org.

Georg Fischer Central Plastics (2003). Electrofusion Installation Procedure Manual, www.centralplastics.com

Plastics Pipe Institute (2008), Handbook of Polythylene Pipe, 2nd Edition. www.plasticpipe,org.

Plastics Pipe Institute (PPI) (2020). Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe. PPI Document TR-33. www.plasticpipe.org.

Plastics Pipe Institute (PPI) (2013). Recommended Minimum Trainin: Guidelines for Polyethylene Pipe Butt Fusion Joining Operations for Municipal and Industrial Projects. PPI Document TN-42. www.plasticpipe.org.

End

SPECIFICATIONS FOR
DIRECTIONAL BORE WATER MAIN

Description

This Specification addresses the installation of water mains by guided boring, including connecting to existing water services or other water mains. The CONTRACTOR will provide all labor, components, materials, tools and appurtenances necessary or proper for the performance and completion of the contract.

Guided boring is a method of trenchless construction using a surface-launched steerable drilling tool controlled from a mobile drilling frame, and includes a field power unit, mid mixing system and mobile spoils extraction system. The drilling frame differs from micro-tunneling; auger boring or pipe jacking equipment is not planned line and depth of the water main. The drilling frame is set back from an access pit that has been dug at the location of a proposed gatewell (or other appurtenances) and a high-pressure fluidjet toolhead that uses a mixture of bentonite clay and water is launched and guided to the correct invert elevation and line required at the gatewell. Using a real-time guidance system attached behind or within the toolhead, and which measures inclination, roll and azimuth, the toolhead is guided through the soil to create a pilot tunnel. Tunneling also may be performed between proposed gatewells or other appurtenances. Upon reaching the pit dug at the section location, the toolhead is removed and a reamer with the product pipe attached is joined to the arm swing and pulled back through the tunnel. A vacuum spoils extraction system removed any excess spoils generated during the installation. The gatewells are then completed at both locations and the surface restored to the original condition.

Site Conditions

1. Drilling operations must not interfere with, interrupt or endanger surface and activity upon the surface, and will be located as called for on the project drawings.
2. CONTRACTOR must comply with all applicable jurisdictional codes and OSHA requirements.
3. When rock stratum, boulders, underground obstructions or other soil conditions that impede the progress of drilling operations are encountered, the CONTRACTOR and ENGINEER will review the situation and jointly determine the feasibility of continuing drilling operations, making adjustments or switching to an alternative construction method.

Materials

1. Pipe and Fittings — Refer to the Township ’s Standard Specifications for HDPE or PVC Pipe and fittings.

2. Drilling Fluid — Drilling Fluid will be a mixture of water and bentonite clay. The fluid will be inert. The fluid should remain in the tunnel to ensure the stability of the tunnel, reduce drag on the pulled pipe and provide backfill within the annulus of the pipe and tunnel.

   Disposal of excess drilling fluid and spoils will be the responsibility of the CONTRACTOR who must comply with all relevant regulations, rights-of-way, work space and permit agreements. Excess drilling fluid and spoils will be disposed of at an approved location. The CONTRACTOR is responsible for transporting all excess drilling fluid and spoils to the disposal site and paying any disposal costs. Excess drilling fluid and spoils will be

transported in a manner that prevents accidental spillage onto roadways. Excess drilling fluid and spoils will not be discharged into sanitary or storm drain systems or waterways. Drilling fluid returns (caused by fracturing or formations) at locations other than the entry and exit points will be minimized. The CONTRACTOR will immediately clean up any drilling fluid which surfaces through fracturing.

Mobile spoils removal equipment capable of quickly removing spoils from entry or exit pits and areas with returns caused by fracturing will be present during drilling operations to fulfill the requirements of the paragraphs above.

The CONTRACTOR will be responsible for repairing any damages to pavement, structures and landscape areas as a result of operations.

The CONTRACTOR will be responsible for making provisions for a clean water supply for the mixing of drilling fluid. A daily permit to use an existing «ctytwnpvllg» fire hydrant can be obtained from the Water Department. The CONTRACTOR will be responsible for complying with all the requirements of that permit and paying all associated fees.

Execution

1. General — The ENGINEER must be notified immediately if any obstruction is encountered that stops for forward progress of drilling operations. The CONTRACTOR and ENGINEER must review the situation and jointly determine the feasibility of continuing drilling operations or switching to an alternative construction method. When it is determined that it is impossible to continue drilling operations, the CONTRACTOR will be directed how to proceed by the ENGINEER.

   Dewatering of pits and excavations must meet the general provisions and specification for water main construction. The type of dewatering method will be at the option of the CONTRACTOR. When water is encountered, the CONTRACTOR must provide a dewatering system of sufficient capacity to remove water, keeping any excavations free of water until the backfill operation is in progress. Dewatering will be performed in a manner that removal of soil particles is held to a minimum.

2. Preparation

   The drilling procedures and equipment will provide protection of workers particularly against electrical shock. As a minimum, grounding mats, grounded equipment, hot boots, hot gloves, safety glasses and hard hats will be used by crewmembers. The drilling equipment will have an alarm system capable of detecting electrical current.

   Removal of trees, landscaping, pavement or concrete will meet the General Provisions and Specifications for water main construction.

   The CONTRACTOR is responsible for existing utilities, as stated under the Miss Dig System, “potholed,” to determine the depth. The costs of any “potholing” will be borne by the CONTRACTOR and included in the bid price for installing the new water main.

3. Guided Boring Operations

   A. Equipment — The drilling equipment must be capable of placing the pipe within the planned line and grade without inverted slopes

      The drilling equipment must have a minimum pullback rating of 35,000 lbs. Torque rating of 2,000-foot lbs. And a mud flow of 24 gallons per minute.

The guidance system must have the capability of measuring inclination, roll and azimuth. The guidance system must have an independent means to ensure the accuracy of the installation. The CONTRACTOR will demonstrate a viable method to eliminate accumulated error due to the inclinometer (pitch or accelerometer). The guidance system will be capable of generating a plot of the borehole survey for the purpose of an as-built drawing. The guidance system must meet the following specifications:

Inclination:	Accuracy	±0.06
	Range	±90
	Repeatability	±0.09
Roll:	Accuracy	±0.1
	Range	0' to 360'
Azimuth:	Repeatability	±0.1
	Range	0' to 360'

Equipment act-up requirements at the designated locations must be determined by the CONTRACTOR and submitted to the ENGINEER per the requirements as stated under "Submittals."

4. Pilot Hole Boring — The entry angle of the pilot hole and the boring process will maintain a curvature that does not exceed the allowable bending radius of the product pipe.

Alignment Adjustments and Restarts:

A. The CONTRACTOR will follow the pipeline alignment as shown on the drawings, within the specifications stated. If adjustments are required, the CONTRACTOR will notify the ENGINEER for approval prior to making the adjustments.

B. In the event of difficulties at any time during boring operations requiring the complete withdrawal from the tunnel, the CONTRACTOR will be allowed to withdraw and abandon the tunnel and begin a second attempt at a location approved by the ENGINEER or at the option of the CONTRACTOR and with the approval of the ENGINEER, the CONTRACTOR may excavate at the point of the difficulty and install the product pipe by trench method per the General Provisions and Specification for construction in effect at «nammun».

C. The number of access pits shall be kept to a minimum and the equipment must be capable of boring the following lengths in a single bore. The guided boring system will have the capability of boring and installing 12-inch diameter watermain in a continuous run without intermediate pits, of a minimum distance of 700 feet.

5. Installing Product Pipe — After the pilot hole is completed, the CONTRACTOR will install a swivel to the reamer and commence pullback operations. Pre-reaming of the tunnel may be necessary and is at the option of the CONTRACTOR.

Reaming diameter will not exceed one-and-four-tenths (1.4) times the diameter of the product pipe being installed.

The product pipe being pulled into the tunnel will be protected and supported so that it moves freely and is not damaged by stones and debris on the ground during installation. Pullback forces will not exceed the allowable pulling forces for the product pipe.

The CONTRACTOR will allow sufficient length of product pipe to extend past the termination point to allow connections to adjacent pipe sections or gate valves. Pulled pipes will be allowed 24 hours of stabilization prior to making tie-ins. The length of extra product pipe will be at CONTRACTOR's discretion.

6. Water Service Connections — Refer to the Township 's Standard Specification for Water Main.

SPECIFICATIONS FOR
FIRE HYDRANTS

Description:

This item shall include the installation of fire hydrant assemblies as specified and shown in the project plans and per the Township of Brownstown Standard Water Main Detail Sheets.

This item shall include furnishing of hydrants, valves, valve boxes, connecting piping and fittings required to complete the work as specified.

The CONTRACTOR is responsible for all connections of the fire hydrant to the water main, valves and fittings and thrust blocks as shown on the Township of Brownstown Standard Water Main Detail Sheets and as directed by the ENGINEER.

All removed hydrants shall be salvaged and immediately delivered to the Township Department of Public Services yard.

Materials

Fire Hydrants

1. All hydrants shall be installed plumb on the lines, levels, grades and locations indicated on the plans. Hydrants shall be set to the established grade and shall have their nozzles parallel to or at right angles to and facing the grade or curb. Orientation shall be as directed by the Fire Department.
2. All hydrants shall be East Jordan Iron Works WaterMaster 5-BR 250 meeting current ANSI/AWWA C502 Standard for Dry-Barrel Fire Hydrants, Underwriters Laboratories Standard UL246 and Factory Mutual 1510. All fire hydrants shall be equipped with two (2) four-inch (4") nozzles in commercial, industrial and residential areas. Interior coatings for all fire hydrants shall meet current NSF 61 Standard. Opening shall be in a counter-clockwise direction. Threads shall be Detroit Standard Thread with one and one eighth (1 1/8) pentagonal nut.
3. All weep/drain holes shall be plugged prior to the fire hydrants being shipped from the factory.
4. Where necessary to adjust for proper hydrant grade and location, the CONTRACTOR shall install additional fitting and spigot pipe between the water main and road box.
5. The CONTRACTOR shall plumb all hydrants at the time they are set with a plumb line or other means acceptable to the ENGINEER. Upon substantial completion of cleanup, the CONTRACTOR shall recheck all hydrants for plumb, grade, and orientation and shall make all adjustments as directed by the ENGINEER. The work of constructing fire hydrants shall not be considered complete until these final adjustments for plumb and grade have been made.

Valve Boxes

Valves boxes shall be a 3 piece screw type shaft, East Jordan Series 6860 or equal conforming to ASTM A48, Class 20. Overall length shall be adjustable from 64-80 inches. Lids shall have "Water"

plainly cast in tops. Install valve boxes to the grade, lines, levels and locations indicated on the plans. Valve boxes shall not transmit shock or stress to the valve and shall be set plumb with covers centered over operating nuts and flush with the indicated surface elevation. Valve boxes that shift or fill during backfilling shall be uncovered and reset.

SPECIFICATIONS FOR GATE VALVES AND WELLS

Description

This item shall include the furnishing and installation of gate valves, connecting piping and fittings, and pre-cast concrete gate wells.
The CONTRACTOR is responsible for all connections of the gate valves to the water main and fittings as shown on the Township of Brownstown Standard Water Main Detail Sheets and as directed by the ENGINEER.

Materials

Gate Valves

Gate vales shall be left hand open, East Jordan Iron Works, resilient wedge valve. All gate valves shall meet the current specifications of AWWA C515 and Underwriters Laboratories Standards UL252.
Interior coatings of all gate valves shall meet the current NSF 61 Standard.

Structures

Material for water main structures shall conform to the requirements listed below.

- Concrete Block (when approved by ENGINEER)
- ASTM C139, Type II, shape and scored as detailed and as approved.
- Pre-cast Concrete Units
- ASTM C478 circular with circular reinforcement as detailed. Provide lifting holes in pre-cast units where indicated.

Manhole Stops

Suitably approved co-polymer polypropylene conforming to ASTM D2146, Type II Grade 49108 with three-eighths-inch (3/8”) minimum diameter deformed reinforcing bar conforming to ASTM A615, Grade 60.

Covers and Frames

Provide types and sizes as detailed on the Township of Brownstown Standard Detail Sheets.

Concrete

In accordance with Division 6, Section 602 of the 2020 MDOT Standard Specifications.

Concrete Reinforcement

In accordance with Division 9, Section 905 of the 2020 MDOT Standard Specifications, use ASTM A615, Grade 60, for bars and ASTM A185 for welded wire fabric.

Construction Methods

Valves

1. All valves shall be installed to the grade, lines, levels and locations indicated on the plans.
2. Valve connections shall be as specified for the piping materials used. Valves shall be set with the stem plumb on permanent, firm foundations as indicated on the plans.
3. Where required, valves shall be supported with special supports as indicated on the plans and as approved by the ENGINEER.
4. Valves shall be installed so as not to receive support from the connecting pipe. In no cause shall valve installation be used to bring misaligned pipe into alignment.

Wells

1. Construct water main valve wells and structures to the grades, lines and levels indicated on the plans and as specified. Structures shall be complete with concrete bases, reinforcing, frames, covers, adjustment rings, etc., as shown and as required for a complete installation. Water main structures shall conform to the dimensions indicated on the plans and as described below.
2. Broken or chipped brick shall not be used on the faces of the structure.
3. Brick shall be laid in neat, even, consecutive courses with full and close mortar joints. Courses shall be level throughout, except as shown or otherwise required. Stagger joints in adjoining courses by one-half (1/2) a brick as nearly as practicable. At least one (1) course in every seven (7) shall be stretcher courses with intervening courses laid as headers. Length of brick closure pieces shall be not less than the width of one (1) whole brick and wherever practicable, closures as headers shall be made from whole brick. Unless otherwise indicated, joints shall be not more than one-half-inch (½") thick and shall be of a uniform thickness throughout the structure. Joints shall be provided as indicated on the plans. Exposed surfaces shall be true and smooth. Rake all joints to receive plaster coat.
4. Prior to applying plaster coat, brick shall be thoroughly wetted with water and the surface allowed to dry sufficiently to effect proper bonding.

Concrete Block

Construct concrete block structures in the locations and according to the details on the plans. The first course of concrete blocks shall be placed on the prepared base or footings in a full bed of mortar. Mortar joints shall be full and close in all courses. Courses shall be level throughout. Stagger joints in adjoining courses by one-half (1/2) the length of the block as nearly as practicable. Joints shall be uniform in thickness throughout the structures. Strike all joints and properly point to provide true, smooth surfaces.

Pre-cast Concrete Units

1. Construct as detailed on the plans. Provide mortar joints struck smooth.
2. Provide two to four (2-4) courses of brick at top of structure for future adjustment.

Plaster Coat

Cement mortar plaster coat shall be applied to the exterior surfaces of all gate wells and other water main structures indicated on the plans. Plaster coat shall be one-half-inch (½") thick and shall be applied to the outer surfaces of the structure.

Castings

Provide and install to the elevations shown all cast iron covers, frames, adjusting rings, anchors, etc., indicated on the plans and as required. Castings shall be set in a full bed of cement mortar one-half-inch (½") minimum. Mortar joints shall be struck smooth.

Steps

Install steps for structures of types and in locations indicated on the plans. Stops shall be installed on 16-inch centers minimum.

Inlet and Outlet Pipe

Pipe placed in structures for inlet outlet connections shall extend through the walls and beyond the outside wall surfaces as sufficient distance to allow for complete connections. Openings between pipes and walls shall be sealed with a full bed of cement mortar. Pipe shall be supported by concrete supports.

Salvaged Gate Valves and Castings

1. All salvaged gate valves shall be returned to the Township of Brownstown Department of Public Services.
2. All existing gate well castings shall be returned to the Township of Brownstown Department of Public Services.

SPECIFICATIONS FOR ABANDONING EXISTING WATER MAIN

Description:

This work shall consist of furnishing and placing a flowable fill mixture where shown on the plans for infill and abandonment of the existing water main and as directed by the Engineer. This work shall be in accordance with the applicable provisions of Section 206 of the 2020 MDOT Standard Specifications for Construction and as herein as provided.

Materials:

General: Flowable fill shall consist of Type 1 Portland cement, granular materials, fly ash, and water mixture utilized as a controlled density fill.

The granular material shall meet MDOT Class IIA requirements, except that 100 percent shall pass the ¾ inch sieve. The fly ash shall meet ASTM C-618 Class F, with no limit on the loss of ignition.

Mixture: The flowable fill mix proportions shall consist of the following:

Material	Pounds Per Cubic Yard	Assumed Specific Gravities
Portland Cement (Type I)	50	3.15
Fly Ash (Class F)	500	2.40
Granular Material	2850	2.60
Water	Sufficient water to provide the desired flowability (approximately 40 gallons).	1.00

The mix may be adjusted by the Engineer.

Transporting: The temperature of the flowable fill mix as it is manufactured and delivered shall be at least 50° F and transported to the point of placement in revolving drum mixer or agitator.

SPECIFICATIONS FOR
HOT MIX ASPHALT (HMA)
SUPERPAVE

Description

This work shall be in accordance with Division 2, Section 204 and Division 5, Sections 501, 502, 503, 504, and 505 of the 2020 MDOT Standard Specifications For Construction, MDOT's HMA Production Manual, Table 1 of MDOT's Special Provision for Acceptance of HMA Mixture on Local Agency Projects (12SP-501J-05), MDOT's Local Agency Programs Hot Mix Asphalt (HMA) Selection Guidelines, MDOT's Quality Assurance Procedures Manual and except as herein specified.

Any possible inconsistencies that may exist between the requirements included herein, and the requirements of the Township of Brownstown for work under their jurisdiction, will be resolved by the ENGINEER at the time such inconsistency is identified.

The CONTRACTOR shall install the Hot Mix Asphalt (HMA) to the dimensions and thickness shown on the plans.

Mixtures

1. Unless otherwise specified, all HMA on this project shall be MDOT Mix Types:
   MDOT 5EML Top Course
   MDOT 4EML Leveling Course
2. The Job Mix Formula (JMF) and Mix Design shall be submitted to the ENGINEER for approval a minimum of 10 business days prior to paving. Do not begin production and placement of the HMA until receipt of the ENGINEER's approval of the JMF.
3. The PG binder grade, application rate and Aggregate Wear Index (AWI) will be as defined in the MDOT Local Agency Program's Hot Mix Asphalt (HMA) Selection Guidelines. Alternative mixes will not be allowed.
4. The HMA will be designed using Super Pave Mix Design Methods in accordance with the MDOT Standard Specifications For Construction, MDOT's HMA Production Manual and other documentation stated in the section titled "Description" above. Maintain the binder content, aggregate gradation, and the crushed particle content of the HMA mixture(s) within the Range 1 uniformity tolerance limits in Table 1 of MDOT Special Provision (12SP-501J-05). For all mixtures, field regress air void content to 3.5% with liquid asphalt cement unless specified otherwise on the HMA application estimate.
5. Aggregates produced from steel furnace slag, reverberatory furnace slag or crushed concrete shall not be permitted in any HMA mixture. Topsoil, clay, or loam cannot be added to aggregates which are to be used in plant mixed HMA mixtures.
6. The aggregate portion retained on the No. 4 sieve shall not contain by weight more than 6% particles which are soft or non durable.
7. Recycled Asphalt Pavement (RAP) may be substituted for a portion of new materials required to produce the HMA mixture(s) as follows:
   a. **For the HMA Top Course, a maximum of 17% RAP binder by weight of the total binder in the mixture will be allowed.**
   b. **For HMA Base Course and Leveling Course mixtures, a maximum of 27% RAP binder by weight of the total binder in the mixture will be allowed**. For HMA Base Course and Leveling Course mixtures containing 18% to 27% RAP, the required asphalt binder grade must be at least one grade lower for the lower temperature than the design binder grade required for the specified mixture type. For instance, for a design binder

grade of PG-58-22, the required grade for the binder in the HMA mixture containing 18% to 27% RAP would be a PG 58-28.

8. **No Recycled Asphalt Shingles (RAS) will be allowed in the HMA mixture(s).**
9. The CONTRACTOR will specify the temperature of the HMA mixture(s) at placement when the JMF is submitted to the ENGINEER for review and approval.

Installation

1. The HMA shall be placed by the self-propelled mechanical paver or spreader to a depth that, when compacted, the mixture will have the thickness, width and slope specified or as directed by the ENGINEER.
2. Paths placed in thickness of 250 pounds per square yard, or less, may be placed in one course.
3. When placing the top course on paths eight feet (8') in width or greater, the material shall be placed using a paver having an automatically controlled and activated screed ad strike-off assembly and corresponding grade referencing equipment as directed by the ENGINEER.
4. A tolerance of ± 20° F from the specified target placement temperature will be allowed. Occasional loads slightly outside the ± 20° F may be permitted, provided that adjustments are
made to bring the temperature of the HMA mixture back to the specified target placement temperature.
5. Any load having a temperature below 250° F or above 350° F at time of discharge from the Hauling unit will be rejected.

Quality Control (QC)

1. **The CONTRACTOR will be responsible for providing the QC for the HMA during production at no expense to the ENGINEER**. Testing will be completed by individuals holding the following MDOT certifications: HMA or Bit Level 1 or HMA or Bit QC/QA.
2. The CONTRACTOR is responsible for providing a Quality Control Plan (QCP) for the HMA in accordance with the HMA Production manual at the time of submittal of the JMF. The CONTRACTOR is responsible for establishing a testing frequency. At a minimum, (1) set of tests will be taken per day of production. It is the responsibility of the CONTRACTOR to notify the ENGINEER of the QC tests results immediately upon completion. In the event the QC tests fail to meet specification, additional QC testing will be performed until the CONTRACTOR is able to demonstrate to the ENGINEER that the JMF is being maintained. All QC test results must be provided to the ENGINEER no later than 3 business days after the date the tests were completed. All "failing" QC test results must be provided to the ENGINEER no later than the next business day.
3. At the direction of the ENGINEER, a maximum of 500 tons of each HMA mix type can be accepted by Visual Inspection (V.I.) per project (not per day).
4. Utilizing the appropriate ASTM or MTM Test Methods, the QC tests results will include and not be limited to the following:

Stability and Flow
Bulk Specific Gravity
Sieve Analysis and % Passing #200
Maximum Theoretical Specific Gravity
% Crushed
% of Recovered Asphalt
% Air Voids

5. After the JMF is established, the aggregate gradation, crushed and bitumen content of the HMA mixture(s) furnished for the project shall be maintained within the Range 1 uniformity Tolerance limits permitted for the JMF as specified in Table 1 titled "Uniformity Tolerance Limits For HMA Mixtures" in the MDOT Special Provision For Acceptance of Hot Mix Asphalt Mixture On Local Agency Projects (12SP-501J-05).

If, however, the CONTRACTOR's QC testing indicates that two (2) consecutive aggregate gradations on one (1) sieve, crushed or bitumen content(s) are outside of Range 1 but within Range 2 as shown in Table 1 of 12SP-501J-05, the CONTRACTOR shall suspend all operations. Contract time shall continue during these times when the HMA plant is down. Before resuming production, the CONTRACTOR shall propose, for the ENGINEER's approval, all necessary alterations to the materials or plant so that the JMF can be maintained. If the necessary alterations cannot be maintained, the ENGINEER may require a new JMF. If, in the ENGINEER's judgement, the non-conforming mixture requires removal, the CONTRACTOR shall remove the mixture at their own expense and replace with a mixture meeting specification requirements. If, in the ENGINEER's judgement the non-conforming mixture can remain in place, the unit price for the non-conforming mixture will be reduced according to the following schedule:

Non-Conforming Item	**Penalty Reduction per SYD**
Asphalt Binder (minus)……	10%
Asphalt Binder (plus)……	5%
Each Sieve……	5%

For any one (1) mixture, if the CONTRACTOR's QC tests indicate (2) or more consecutive parameters, such as aggregate gradation on one (1) sieve, crushed or binder content exceed the uniformity tolerance of Range 2 shown in Table 1 of 12SP-501J-05, the mixture will be rejected. If in the ENGINEER's judgement the defective areas warrant removal, the CONTRACTOR shall remove and replace the areas, at the CONTRACTOR's expense, with mixtures meeting specification requirements. If in the ENGINEER's judgement the defective material can remain in place the contract unit price for the material outside of Range 2 will be decreased by 15% for each parameter.

Rolling and Compacting

1. Each layer of the HMA shall be compacted to the required density with approved rollers. At least two rollers will be required when the lay-down rate exceeds 800 square yards per hour.
2. Steel three-wheel rollers may be used for initial paving immediately following the paving immediately following the paver.
3. The final rolling operation on each layer of HMA shall be accomplished by use of tandem steel-wheel rollers or by use of vibratory rollers operated in the static mode.
4. Roller wheels will be kept properly moistened with water.
5. Pneumatic-tired rollers will not be permitted on wearing courses.
6. Pneumatic-tired rollers shall be operated in a competent manner and shall not mark or rut surface or displace the pavement edge.
7. The pneumatic-tired roller shall be ballasted to obtain the required ground contact pressures as directed by the ENGINEER. In order to obtain a uniformly textured mat and the

desired pavement density, the ENGINEER may direct the CONTRACTOR to raise or lower tire pressures at any time during the rolling operations. The roller operations shall be conducted in such a manner as to prevent scuffing or chatter marks in the pavement surface. The number of passes made by the pneumatic-tired roller shall not be less than two (2) round trip passes over each area.

8. Rolling of the mixture shall begin as soon after placing as it will bear the roller without undue displacement, picking up the mat or cracking. Rolling shall start longitudinally at the extreme sides of the lanes and proceed toward the center of the pavement, overlapping on successive trips by at least half the width of the drive wheel of the roller. Alternate trips of the roller shall be of slightly different lengths. The maximum roller speed for the type of mixture or thickness of the layer being placed.
9. When compacting an adjoining lane, the longitudinal joint shall be rolled first with the roller supported mainly on the cold lane with only three-to-six inches (3-6") of the roller extending onto the freshly placed HMA.
10. Finish rolling shall continue until all roller marks are eliminated.
11. Areas inaccessible to the standard eight (8) ton tandem rollers shall be compacted by self-propelled trench rollers of suitable width, approved by the ENGINEER, and weighing not less than 300 pounds per inch of width.
12. Skin patching will not be permitted on any area that has been rolled.
13. Any mixture that becomes mixed with foreign material or is any way defective shall be removed and replaced at the CONTRACTOR's expense.
14. Rolling shall proceed continuously until the required compaction is obtained.
15. The measurement of field compacted density will be accomplished utilizing a nuclear density
gauge. The percent (%) compaction shall be determined by using the Gmm from the JMF for the density control target. The required in place density of the HMA mixture must be 92.0 % to 96.0 % of the density control target.
16. Unless otherwise directed by the ENGINEER, field density tests utilizing the nuclear density gauge will be obtained at a frequency of one (1) test for every 250 lineal feet of paving lane (unit), except for the last unit which will be 250 lineal feet plus any fractional unit less than 125 lineal feet in length, or will be a fractional unit 125 lineal feet or more in length. Miscellaneous areas such as intersections, crossovers and widened lanes less than 125 feet in length will be tested at the discretion of the ENGINEER.
17. Nuclear density tests will be taken on a random basis longitudinally within each unit and transversely within each unit. Tests will be taken at the discretion of the ENGINEER in areas that have received the least amount of compactive effort. Individual tests failing to meet the required in place density will be penalized as described below:
    a. When individual density tests fail to meet 92.0 % to 96.0 % of the density control target as determined above, two (2) additional density tests will be taken in the 250 lineal foot pavement unit. The two (2) additional density tests will be taken at a minimum of 25 feet from the original test.
    b. The average of the three (3) tests will be used to base the penalty and compute an adjusted price in accordance with the following schedule:

AVERAGE TEST RESULTS	**PRICE ADJUSTMENT per SYD**
92.0% to 96.0%	100%
91.0% to 91.9% and 96.1% to 97.0%	90%
90.0% to 90.9% and 97.1% to 98.0%	80%

89.0% to 89.9%.....70%
88.0% to 88.9% and 98.1% to 99.0%.....50%
Less than 88.0% and Greater than 99.0%.....No Payment or Removal as Directed by the ENGINEER

The Square Yard's (SYD) to be penalized will be computed by the ENGINEER based on the length of unit and width of paving lane.

Weather and Seasonal Limitations

1. HMA shall not be placed, nor the prime or bond coat applied, when rain is threatening or when the moisture on the existing surface would prevent satisfactory bonding.
2. Unless otherwise approved by the ENGINEER in writing, temperature and seasonal requirements for placing hot mix asphalt shall be in accordance with the current MDOT standards.
3. HMA paving will not be allowed when there is frost in the grade.

Protection of Structures

Structures shall be protected to prevent their surfaces from being discolored during the application of HMA to the road surface.

Equipment

1. The CONTRACTOR shall furnish sufficient equipment for the placing of the hot mix asphalt.
2. The equipment shall be on the job site and ready for normal operation before the placing of material is started.
3. All equipment shall be in good working order.
4. The equipment shall be subject to inspections and testing during construction.
5. The equipment shall be of sufficient capacity that the operation can be continuous and a rate of production obtained which insures good workmanship and eliminates overloading of the equipment or frequent interruptions or delays.
6. The equipment shall conform to the requirements as specified in Division 5, Section 501 of the 2020 MDOT Standard Specifications.
   A. Flasher Lights for Bituminous Concrete Equipment
      - On HMA construction, where traffic is being maintained, chip spreaders, distributors and rollers shall be equipped with at least one (1) approved flashing, rotating or oscillating amber light, and pavers shall be equipped with at least one (1) such light on each side of the paver.
      - The lights shall be mounted so that the warning signal will be visible to traffic in both directions. The lights shall be in operation all the while the work is in progress.
   B. Hauling Equipment
      - Trucks used for hauling hot mix asphalt shall have tight, clean, smooth beds that have been thinly coated with lime solution or other approved release agent to prevent the mixture from adhering to the beds.
      - Each truck shall have an adequately secured cover of such size and material as to completely protect the mixture from the weather and to retard the escape of heat from the mixture.
   C. Pressure Distributor

- The distributor shall be mounted upon a vehicle that is capable of maintaining the uniform speeds required for proper application of the hot mix asphalt.
- The vehicle shall be equipped with an accurate tachometer, which is calibrated to indicate speed in feet per minute.
- The pressure distributor shall have a capacity of at least 800 gallons.
- It shall be equipped with heating facilities capable of maintaining the hot mix asphalt at the specified temperature.
- A positive displacement-type pump, installed so as to permit circulation of the material in the tank and between the tank and the spray bar shall be provided.
- The pump power shall be independent of the vehicle power of the pump which shall be operated by a power take-off from the vehicle power motor in such a manner that uniform distribution of the hot mix asphalt at the rate specified will be obtained.
- The distributor shall be equipped with a tachometer calibrated in revolutions per minute or gallons per minute.
- Full circulating spray bars shall be available for application widths of three feet (3') to 24 feet in one-foot (1') increments.
- The nozzles shall produce a uniform fan spray, and the shutoff shall be instantaneous with no dripping. Nozzles in various sizes between one-eighth inch (1/8") and one-quarter inch (¼") inclusive shall be available.
- The spray bar shall be set at the proper height to provide a uniform application at the specified coverage rate.

D. Pavers

- The paver shall be an approved self-powered machine capable of spreading and finishing the mixture in a uniform layer at the desired thickness and cross section and ready for compaction.
- The use of any machine in poor mechanical or worn condition will not be permitted.
- The paver shall be of such design that the supporting wheels, treads or other devices ride on the prepared base.
- The full width of surface being applied shall be screeded by an oscillating or vibrating screed.
- The paver shall at all times produce a uniformly finished surface, free from tearing or other blemishes that would require hand work.
- The screed shall be adjustable to provide for tilting to secure the proper drag or compressive action necessary to produce the desired surface texture.
- The paver shall be equipped with a hopper and an automatic material-depth control device so that each distributing auger and corresponding feeder shall respond automatically to provide for a constant level of mix ahead of the screed unit to the full width of the lane being paved.
- In order to ensure that adequate material shall be fed to the center portion of the lane being paved, reverse pitch augers or paddles shall be installed at

the inside of one or both ends of the auger shafts to force the mix to the middle portion of the lane.

- If necessary to prevent segregation of the mix as it drops of the feed conveyor, battle plates shall be installed at the required location.
- When extensions are added to the paver, they shall be provided with the same vibrating screed or tamper action as the main unit of the paver, except for paving variable width areas.
- The extensions also shall be equipped with a continuation of the automatically controlled spreading augers.
- The screed and any extensions shall be provided with an approved method of heat distribution.
- Unless specified otherwise, hot mix asphalt pavers shall be equipped with an automatically controlled and activated screed and strike-off assembly capable of grade reference and transverse slope control.
- A manufacturer approved grade referencing attachment, not less than 30 feet in length, shall be used for all lower courses and the first lane of the wearing course.
- After the first lane of the wearing course has been placed, a 10-foot or longer grade referencing attachment may be substituted for constructing subsequent adjacent lanes of wearing course.
- A self-propelled mechanical spreader capable of maintaining the proper width, depth, and slope without causing segregation of the material may be used for base courses and for surface courses less than eight feet (8') in width.
- When surfacing ramps or shoulders, or when the grade of concrete gutter or other existing installation must be met, the manner of use or the automatic grade reference and slope control devices shall be determined by the ENGINEER.
- Whenever a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually for the remainder of the normal working day, provided this method of operation will produce results meeting the specification requirements.

E. Mixers

- Mixers shall be self-propelled and a combination scarifier, pulverizer, mixer and liquid distributor. Unless otherwise specified, a minimum of two (2) mixers will be required.
- If hot mix asphalt is used as a stabilizer, one mixer shall be self-propelled single-pass stabilizer, combining a cutting rotor, a blending rotor and at least one mixing rotor in the mixing chamber.
- The spray bar for distribution of the liquid shall operate in such a manner that all asphalt will be uniformly applied through the mixer at the time of mixing.
- The equipment for distributing the bituminous material shall be adjustable and shall measure accurately the amounts of bituminous material being applied.

- The bitumen pump shall be a positive displacement type pump. It shall be equipped in such a manner as to make it possible to check accurately the rate of application of the bitumen at any time.
- The mixer shall meet the approval of the ENGINEER.

F. Joint Heaters

- Joint heaters shall be infrared or other approved heaters, equipped with automatic ignition and extinguishing system to ensure that the heater operates only when the paver is moving.
- It shall be of sufficient length and heating capacity to adequately soften the edge of the mat.
- The heater shall be oriented parallel to the joint edge.
- The hot mix asphalt shall not be heated by a direct open flame.

G. Rollers

- Steel-Wheel — Steel-Wheel rollers shall weigh at least eight (8) tons and shall be self-propelled, vibratory or static, tandem rollers or shall be self-propelled static three-wheel rollers.
  a. Steel-wheel rollers shall be free from backlash, faulty steering mechanism, or worn king bolts.
  b. The steering device shall respond readily and permit the roller to be directed on the alignment desired.
  c. Rollers shall be equipped with wheel sprinklers and scrapers.
  d. Roller wheels shall be smooth and free from openings or projections that will mar the surface of the pavement.
  e. Vibratory rollers shall have a shutoff to deactivate the vibrators when the roller speed is less than 0.5 mph and shall have provisions to lock in the manufacturer's recommended speed, the vibrations per minute, and the amplitude of vibration (Dynamic force) for the type of bituminous mixture being compacted.
- Pneumatic-Tired
  a. The pneumatic-tired roller shall be of the self-propelled type with a total weight, including ballast, no greater than 30 tons.
  b. It shall be equipped with a minimum of seven (7) wheels situated on the axles in such a way that the rear group of tires will not follow in the tracks of the forward group but will be so spaced that a minimum tire path overlap of one-half inch (½") is obtained.
  c. The tires shall be smooth and shall be capable of being inflated to or adapted to achieve a pressure necessary to provide ground-contact pressures of at least 80 pounds per square inch.
  d. The tire pressures shall not vary by more than five (5) pounds per square inch between individual tires.
  e. The CONTRACTOR shall furnish the ENGINEER charts or tabulations showing the contact areas and the contract pressures for the full range of tire inflation pressures and tire loadings for the type and size roller used.

f. The roller shall be equipped with a mechanism capable of reversing the motion of the roller smoothly.

g. The roller shall be equipped with wheel sprinklers and scrapers or mats.

H. Drag

- An approved drag to level and properly distribute the cover material shall be available for use.
- Such a drag may be made from one layer of chain link fencing eight-feet (8') wide and at least 10-feet long, so constructed and hitched as to cover half the rod width when dragged over the surface, or may be a brush broom drag of approved design.

I. Miscellaneous Equipment

- Sufficient equipment for handling and hauling covered material shall be provided to insure prompt and continuous covering of hot mix asphalt.
- A self-propelled power broom, straight edges for testing, thermometers and all necessary small tools to completely and satisfactorily finish the work shall be provided by the CONTRACTOR.

SPECIFICATIONS FOR AGGREGATE BASE (CIP)

Description

This work shall be in accordance with Division 3, Section 302 of the 2020 MDOT Standard Specifications, except as herein specified.

1. Removal of Existing Pavement on Aggregate base: The CONTRACTOR is responsible for the removal of existing pavement, and existing aggregate base to the depth required to provide for the proposed cross section. Additional base material shall be placed where there are areas of deficiency, as directed by the ENGINEER.
2. Removal of Existing Pavement on Subgrade: The CONTRACTOR is responsible for the removal of existing pavement and the subgrade to the minimum depth call out in the plans in order to place aggregate base material, as directed by the ENGINEER. The CONTRACTOR must *proof roll the subgrade prior to placement of the aggregate base.
3. New pavement: The CONTRACTOR shall be responsible for excavation to the bottom elevation of the aggregate base, and prior to placement of the aggregate base, *proof rolling the subgrade in the presence and to the satisfaction of the ENGINEER, and installation of the aggregate base per the plans and as directed by the ENGINEER.

   *Proof rolling will be used to determine areas where the subgrade is not sufficiently compacted or exhibits the presence of poor and weak soils. The CONTRACTOR will provide the equipment to perform the proof roll such as: heavy rubber tired roller with an operating weight of 12.5 tons per wheel and 70 to 90 psi per tire, tandem wheel dump truck loaded with a minimum of 20 tons of material or as otherwise approved by the ENGINEER. Two (2) complete passes of the equipment will be required in the area being tested. Areas found to exhibit more than 2” of deflection, or show signs of rutting or pumping will be undercut to a depth determined by the ENGINEER and backfilled with 21AA aggregate base course or other aggregate as directed by the ENGINEER.

   Unless otherwise directed by the ENGINEER, the aggregate base course shall be compacted to 95% of its maximum unit weight. % Compaction will be determined using a nuclear density gauge and the methods described in the MDOT Density Control Handbook.

4. Grading of the aggregate base will be incidental to the overall placement of the 21AA limestone aggregate.
5. The CONTRACTOR shall be responsible to haul away all of the spoils, including loading, trucking and disposal generated from installation of the aggregate base to an offsite location designated by the CONTRACTOR. .

Materials

The material shall be 21AA crushed limestone or blast furnace slag and shall conform to the grading and physical requirements of Division 9, Section 902 of the 2020 MDOT Standard Specifications. The 21AA must be a MDOT Prequalified Aggregate Source. Shipping tickets must be provided to the inspector for each load upon delivery. The shipping tickets must state the MDOT Pit Number for the aggregate source and the additional information described in Section 302.03.A of the MDOT Standard Specifications.

SPECIFICATIONS FOR CONCRETE PAVEMENT

6-17-24

Description

This work shall be as specified in Division 6, Section 602 and 603 of the MDOT 2020 Standard Specifications for Construction, except as herein specified.

Mix Designs

Design concrete mixtures must meet the requirements of Concrete Grade 4000 specified in Table 1004-1, unless otherwise specified, of the MDOT Standard Specifications for Construction. A variance can be requested in writing and must be approved by the ENGINEER when proposing a mix design that exhibits temperature, slump or air content other than those specified. Do not use a grade of concrete with a minimum specified 28 day compressive strength greater than what is designated for in the application.

The mix shall have an entrained air content of 5.5% to 8.5%, a maximum slump of three (3) inches which can be increased to six (6) inches with a MDOT approved mid-range water reducer and have a minimum 28 day compressive strength of 4000 psi unless otherwise specified.

Mix designs must be submitted to the ENGINEER for review and approval 10 working days before the anticipated date of placement. Mix designs submitted that do not include all of the required documentation will be considered incomplete and returned without review.

Materials:

1. **The 6AA coarse aggregate shall have a freeze thaw dilation less than 0.040 % per 100 cycles and have a maximum absorption of 2.0%.** It will be the responsibility of the Contractor to provide to the Engineer a copy of all delivery tickets of the 6AA coarse aggregate used by the concrete supplier for each day of concrete placement within 48 hours of the concrete placement. **In the event the concrete supplier cannot provide the shipping tickets that indicate the 6AA coarse aggregate used for a particular placement came from the source approved in the concrete mix design to the Engineer's satisfaction, the Engineer will reduce payment of the contract unit price for the contract item by 30%.**
2. The maximum slump for concrete is 3 inches unless as otherwise allowed in the approved mix design. The slump can be increased to a maximum of 6" with the addition of a Mid-Range (MR) water reducer listed in the MDOT Quality Assurance Manual at a dosage rate prescribed therein.
3. The maximum water/cementitious materials ratio must not exceed **0.45**. Cementitious materials is defined as the combined weight of all cementitious materials such as cement or ground granulated blast furnace slag (GGBFS).
4. **The concrete mix shall contain 25% - 35% replacement of the Portland cement, or Portland-Limestone cement (Type 1L) with GGBFS (Grade 100 minimum).** A blended cement meeting the requirements of ASTM C 595 containing Portland cement or Portland-limestone cement (Type 1L) and slag cement (25-35%) may also be used.
   4a. Documentation must be provided for each concrete mix design submitted that the GGBFS is able to control the effects of Alkali Silica Reactivity (ASR). Submit ASTM C 1567 test data using the mix proportions and constituent sources for both the aggregates and the cementitious materials that will be used for the project. The test data should show at least (3) test specimens (mortar bars) for each cementitious materials aggregate combination. If the average of 3 mortar bars for a given

cementitious materials aggregate combination produces an expansion less than 0.10 % (rounded to the nearest 0.01%) at 14 days of immersion, the submitted mix design is considered to be non-deleterious to ASR. If the average expansion is 0.10% (rounded to the nearest 0.01%) or greater, the submitted mix design will be considered insufficient to mitigate ASR and will be rejected.

4b. In lieu of ASTM C 1567, test data from ASTM C 1260 or ASTM C 1293 is acceptable. If the data from the ASTM C 1260 test shows the mortar bars to have expanded less than 0.10% (rounded to the nearest 0.01%) at 14 days of immersion the concrete mix will be considered to be non-deleterious to ASR. If the test data ASTM C 1293 test shows the expansion of the concrete prisms is not greater than 0.040% (rounded to the nearest 0.001) after 1 year, the concrete mix will be considered non-deleterious to ASR.

5. **Between November 1st and April 1st the concrete mixture(s) must utilize a non-chloride accelerator listed in the MDOT Quality Assurance Manual at a dosage rate prescribed therein.**

6. **Unless otherwise directed by the Engineer, the air content shall be 5.5% to 8.5%.** Tests for air content will be completed from samples taken at the point of discharge, at the outlet hose or before the paving machine.

When directed by the Engineer, an air test will be taken from a sample obtained from concrete that has just passed through the paving machine and has not been finished. If the concrete sampled from behind the paver, when tested, fails to contain a minimum air content of 5.0%, or indicates an air content exceeding 8.5%, paving shall cease. It will be the Contractor's responsibility to make those changes necessary to the concrete such that a minimum of 5.0% and no more than a maximum of 8.5% air content is present in the concrete after having passed through the paver. Paving shall only be allowed to continue after the Contractor has taken sufficient corrective action and the follow up test for air content after (or behind) the paver indicates a minimum air content of 5.0% and no more than 8.5%.

Construction Methods

1. Provide an automated printout of target, actual batch weights and material sources with each delivery ticket. If target, batch weight and material source(s) information is computer generated on a separate document, include the serial number of the corresponding delivery ticket or other means of cross reference. Attach the automated printout of target, actual batch weights and material sources to the corresponding delivery ticket. A copy of the concrete batch/delivery ticket(s) will be provided to the inspector upon delivery. **Concrete delivered to the project without the target, material source and batch weight information on each delivery ticket as described previously will be rejected and not allowed to be placed.**
2. Add water to concrete transported in truck mixers only if additional mixing water is needed for the concrete to achieve the slump specified in the approved mix design. Do not add more water than specified in the approved mix design, based on the maximum water content and maximum water to cementitious material ratio. After adding water provide at least 30 revolutions of the truck mixer drum at mixing speed before discharging concrete. Document on the delivery ticket the amount of additional water added. Do not add water to the concrete during discharge or placement. DO not add water in truck chutes or pump or slipform hopper beyond the minimum necessary to wet the surfaces for lubrication.
3. The CONTRACTOR shall designate, with the approval of the ENGINEER, an area that can be utilized to clean the chutes of the concrete delivery trucks. Cleaning of the chutes into the pavement grade is forbidden.

Curing

Curing shall be in accordance with Division 6, Section 602 of the 2020 MDOT Standard Specifications for Construction, except that for textured surfaces, there shall be one application of curing compound at the rate of one (1) gallon per 150 square feet. **Application of the curing compound will begin as soon as the free water leaves the surface of the pavement.**

Integral Curb

1. Integral curbs shall be constructed monolithically with the pavement slab.
2. The curb material shall be placed before the pavement has started its initial set, and shall be of the same mix and shall conform, in all respects, to the requirements for concrete in the pavement.
3. For nonslip-form paving, immediately following the final floating of the pavement, the area where the curb material is to be placed shall be roughened so as to secure a good bond between the pavement and the curb.
4. For nonslip-form paving, face and back forms will be required when constructing curb.
5. The curb shall be spaded sufficiently to eliminate all voids, and tamped to bring the mortar to the surface.
6. Immediately after the removal of the forms, any visible areas of honeycomb or minor defects shall be filled with mortar, composed of one (1) part Portland cement and two (2) parts of fine aggregate from the same source as used in the pavement, applied with a wooden float.
7. Immediate steps shall be taken by the CONTRACTOR to correct the conditions contributing to these defects.

Slip-Form Paving

1. The slip-form paving equipment shall have automatic horizontal and vertical controls.
2. If the CONTRACTOR cannot maintain the required horizontal and vertical controls using his selected method, the use of slip-form methods shall be discontinued and the pavement shall be placed by means of fixed forms.

Sectioning (Hand Work)

1. Any full depth pavement removal and replacement over 150’ in length shall use a paving apparatus (mechanical means) to place, strike off and finish the concrete. The paving apparatus shall have vibrators of the internal type attached to the apparatus capable of affecting the concrete approximately 12” from the vibrator head. The vibrators shall start and stop with the movement of the paving apparatus.
2. Vibratory screeds or rollers may be used if APPROVED in advance by the ENGINEER. The CONTRACTOR is still responsible to provide internal vibration if a vibratory screed or roller is used. Internal vibration utilizes a hand held portable immersion type device with a head diameter of 2-1/2” to 3” and a recommended frequency of 8,000 to 12,000 vibrations per minute (vpm). The vibrator shall be lowered vertically into the concrete at regularly spaced intervals. Dragging of the portable vibrator is not allowed.
3. Concrete pavement in areas less than 150’ in length that is placed, screeded and finished by manual methods (hand work) shall use an internal vibrator as described in item 2. The CONTRACTOR shall demonstrate to the ENGINEER prior to the placement of any concrete the presence of and operational ability of a portable internal immersion type vibrator(s).

Paving Joints

1. Joints in the concrete pavement shall be placed as required in Division 6, Section 602 of the 2020 MDOT Standard Specifications for Construction and shall conform to the current MDOT Standard Plans and positions shown on the plans or as directed by the ENGINEER.

2. Expansion joints with load transfer shall be placed at spring points, at locations shown on the on the plans, and at locations indicated as follows:
   A. Where necessary to relieve horizontal pressure at sharp vertical curves, expansion joints shall also be placed as shown on the plans or where directed by the Engineer.
   B. Expansion joints shall be placed at the P.C. and P.T. or horizontal curves where the degree of curvature is 2°30′ or more.
   C. During the period of September 15th to April 15th, expansion joints shall be spaced at maximum intervals of 324 feet. On curves, expansion joints need not necessarily be placed at the P.C. or P.T. of curve. If any portion of a multiple lane pavement is to be placed between September 15th and April 1st, expansion joints for the entire width of the pavement shall be spaced at maximum intervals of 324 feet.
3. The edges of all transverse joints in the integral curb shall be rounded with an approved finishing tool have a radius of one-quarter inch (1/4") or mats shall be lapped approximately 12 inches, and the pavement reinforcement shall stop (6") from all expansion or contraction joints.
4. End-of-pour joints shall be placed at the location of the full-width pavement and the start of non-reinforced concrete temporary transition tapers as shown on the plans and elsewhere as directed by the ENGINEER.
5. External Longitudinal Pavement Joints shall be placed as shown on the plans.

Paving Requirements

1. **The CONTRACTOR is to use a paving apparatus (mechanical means) that can pave the proposed total road width at one time and shall have vibratory and screeding capabilities. The paving apparatus (mechanical means) will be approved by the ENGINEER prior to the start of paving. With prior approval from the ENGINEER, the CONTRACTOR may be able to pave half width at a time. If the CONTRACTOR can provide reasonable evidence and schedule that the roadway will be completed on time. Paving the road 1/3 at a time will not be acceptable.**
2. Slip-form paving equipment shall have automatic horizontal and vertical controls.
3. If the CONTRACTOR cannot maintain the required horizontal and vertical controls using his selected method, the use of slip-form methods shall be discontinued and the pavement shall be placed by means of fixed forms.
4. The CONTRACTOR shall demonstrate to the ENGINEER prior to the commencement of the paving operation the presence of and operation of a portable hand held immersion type vibrator(s).

Concrete Mixtures Subject to Rejection or Penalty

Air Content:

During the course of the paving or placement operation, an air test(s) will be completed for acceptance from the concrete at the point of discharge and at a frequency designated by the Engineer. If the concrete air test fails to meet the specified air content required (5.5% to 8.5%), the concrete plant operator will be immediately notified to make a correction. The 1st air test will be considered the initial air test and the location and volume of concrete it represents will be noted. The next air test will be taken on the concrete sample which represents the corrected concrete and will be called the corrected air test. If the corrected air test meets contract specifications, the concrete will continue to

be placed. If the corrected air test fails to meet contract specifications, the concrete placement operation will be halted until a correction can be made at the concrete production plant to bring the air content within specification. The nonconforming concrete which is placed between the initial air test and the succeeding corrected air test will be removed, if in the opinion of the Engineer the concrete warrants removal. The removed concrete will be replaced by concrete meeting contract specifications at the Contractor's expense. If in the opinion of the Engineer the concrete can remain in place, the contract unit price for the contract pay item will be reduced in accordance with the following schedule (this reduction is in addition to any other reductions):

Average of Initial and Corrected Air Test:	**Reduction**
5.0% to 5.4%	10%
4.6% to 4.9%	20%
4.2% to 4.5%	30%
4.0% to 5.0%	50%
3.9% and Below	**REMOVAL**
8.6% to 8.9&	15%
9.0% to 9.3%	30%
9.4% to 9.5%	50%
9.6% and Above	**REMOVAL**

Compressive Strength:

When the compressive strength test specimens representing a particular section of concrete fail to meet the required 28 day compressive strength requirement, the Contractor shall remove and replace the concrete at no cost to the owner. If the Engineer determines the concrete can remain in place, the contact unit price for the contract pay item will be reduced as follows:

RCS = Required 28 Day Compressive Strength per contract specification

ACS = Actual 28 Day Compressive Strength determined from strength specimens from particular pour

Adjustment Unit Price (% Reduction)	**Actual 28 Day Compressive Strength Test Results (ACS)**
2.0 X $\frac{RCS - ACS}{RCS}$ X Contract Unit Price	1.0% 5.0% below the RCS
2.75 X $\frac{RCS - ACS}{RCS}$ X Contract Unit Price	5.1% to 10.0% below the RCS
3.5 X $\frac{RCS - ACS}{RCS}$ X Contract Unit Price	10.1% to 14.0% below the RCS
Remove & Replace, or as directed by the Engineer	**More than 14.0% below the RCS**

Coring:

Coring will be allowed, when approved by the Engineer to verify the required 28 day compressive strength. Instances requiring coring, other than for thickness, may include failure of a representative section of concrete to meet 86% of the required 28 day compressive strength or in the event that the compressive strength specimens are missing or had been damaged.

When the 28 day compressive strength test specimens fail to meet 86% of the required 28 day compressive strength required in the contract specification, the Engineer may require the particular section of concrete in question to be cored. If the compressive strength of the cores meet or exceed the 28 day compressive strength required in the contract specification, the representative section of concrete in question will be deemed to have met the contract requirements and will be paid at 100% of the contract unit price for that contract pay item. If the cores fail to meet the 28 day compressive strength required in the contract specification, the contract unit price for the contract pay item will be reduced for a particular section of concrete per the formulas described above for Compressive Strength. For cores that fail to meet 86% of the required 28 day strength as designated in the contract specification, the representative section of concrete will be removed and replaced at the expense of the contractor. All costs related to coring shall be paid for by the Contractor.

When compressive strength test specimens are lost or damaged while in the possession of the Engineer and coring is required to verify the 28 day compressive strength of a representative section of concrete, 100% of the contract unit price for the contract pay item for that particular section of concrete will be paid if the compressive strength of the cores meets or exceeds the 28 day compressive strength required in the contract specification. If the cores fail to meet the 28 day compressive strength required in the contract specification, the contract unit price for the contract pay item will be reduced for a particular section of concrete per the formulas described above for Compressive Strength. For cores that fail to meet 86% of the required 28 day strength as designated in the contract specification, the representative section of concrete will be removed and replaced at the expense of the contractor.

All coring shall be witnessed by the Engineer. The Engineer shall take possession of all cores and designate a laboratory to test the cores. The Contractor will pay for all costs associated to test the cores in the event the compressive strength specimens fail to meet contract requirements or the Contractor damages the compressive strength cylinders while field curing.

SPECIFICATIONS FOR CONCRETE DRIVE APPROACH 6-17-24

Description
This work shall be in accordance with Division 8, Section 801 of the 2020 MDOT Standard Specifications, except as herein specified.

Mix Designs
Design concrete mixtures must meet the requirements of Concrete Grade 4000 specified in Table 1004-1, unless otherwise specified, of the MDOT Standard Specifications for Construction. A variance can be requested in writing and must be approved by the ENGINEER when proposing a mix design that exhibits temperature, slump or air content other than those specified. Do not use a grade of concrete with a minimum specified 28 day compressive strength greater than what is designated for in the application.

The mix shall have an entrained air content of 5.5% to 8.5%, a maximum slump of three (3) inches which can be increased to six (6) inches with a MDOT approved mid-range water reducer and have a minimum 28 day compressive strength of 4000 psi unless otherwise specified.

Mix designs must be submitted to the ENGINEER for review and approval 10 working days before the anticipated date of placement. Mix designs submitted that do not include all of the required documentation will be considered incomplete and returned without review.

Materials:
1. **The 6AA coarse aggregate shall have a freeze thaw dilation less than 0.040 % per 100 cycles and have a maximum absorption of 2.0%.**
2. The maximum slump for concrete is 3 inches unless as otherwise allowed in the approved mix design. The slump can be increased to a maximum of 6" with the addition of a Mid-Range (MR) water reducer listed in the MDOT Quality Assurance Manual at a dosage rate prescribed therein.
3. The maximum water/cementitious materials ratio must not exceed **0.45**. Cementitious materials is defined as the combined weight of all cementitious materials such as cement or ground granulated blast furnace slag (GGBFS).
4. **The concrete mix shall contain 25%-35% replacement of the Portland cement, or Portland-Limestone cement (Type 1L) with GGBFS (Grade 100 minimum).** A blended cement meeting the requirements of ASTM C 595 containing Portland cement and slag cement (25% - 35%) may be used.
    4a. Documentation must be provided for each concrete mix design submitted that the GGBFS is able to control the effects of Alkali Silica Reactivity (ASR). Submit ASTM C 1567 test data using the mix proportions and constituent sources for both the aggregates and the cementitious materials that will be used for the project. The test data should show at least (3) test specimens (mortar bars) for each cementitious materials aggregate combination. If the average of 3 mortar bars for a given cementitious materials aggregate combination produces an expansion less than 0.10 % (rounded to the nearest 0.01%) at 14 days of immersion, the submitted mix design is considered to be non-deleterious to ASR. If the average expansion is 0.10% (rounded to the nearest 0.01%) or greater, the submitted mix design will be considered insufficient to mitigate ASR and will be rejected.

4b. In lieu of ASTM C 1567, test data from ASTM C 1260 or ASTM C 1293 is acceptable. If the data from the ASTM C 1260 test shows the mortar bars to have expanded less than 0.10% (rounded to the nearest 0.01%) at 14 days of immersion the concrete mix will be considered to be non-deleterious to ASR. If the test data ASTM C 1293 test shows the expansion of the concrete prisms is not greater than 0.040% (rounded to the nearest 0.001) after 1 year, the concrete mix will be considered non-deleterious to ASR.

5. Between November 1st and April 1st the concrete mixture(s) must utilize a non-chloride accelerator listed in the MDOT Quality Assurance Manual at a dosage rate prescribed therein.

Miscellaneous

1. The base for all drive approaches shall be 21AA Crushed Limestone, Crushed Concrete or blast furnace slag and shall be six-inches (6") thick compacted in place (CIP) and shall be considered incidental to the drive construction.
1. All residential concrete drive approaches shall have a transverse expansion joint at the existing sidewalk one inch (1") and at the back of the existing sidewalk of one-half inches (0.5").
2. All residential concrete drive approaches shall be six inches (6") thick and have a thickened edge as directed by the ENGINEER.
3. All commercial and industrial drive approaches shall be installed per MDOT Detail "M", as directed by the ENGINEER, and shall be eight inches (8") thick.
4. All concrete drive approaches, unless called for in the plans, shall be non-reinforced.
5. The CONTRACTOR shall be responsible for the installation of all joints as shown in the plans and as directed by the ENGINEER. All expansion joints shall be sealed with a hot-poured elastic-type compound.
6. The CONTRACTOR is responsible for adjusting all existing structures in the approaches to the final grade or as directed by the ENGINEER.
7. New manholes are not allowed in drive approaches, and fire hydrants shall be at a minimum five feet (5') from approaches.

Curing

1. Curing shall be in accordance with Division 6, Section 602 of the 2020 MDOT Standard Specifications, except that or textured surfaces, there shall be one (1) application of curing compound at the rate of one (1) gallon per 150 square feet.

Concrete Mixtures Subject to Rejection or Penalty

In the event field tests indicate that the air content of the plastic concrete does not meet a minimum of 5.5% or exceeds the maximum of 8.5% as required in this specification, the contract unit price for the contract pay item will be reduced as detailed in the "Specification For Concrete Pavement", per the section titled "Concrete Mixtures Subject to Rejection or Penalty", subsection titled "Air Content".

In the event compressive strength specimens fail to meet the 28 day compressive strength required in the contract specification; or in the event the compressive strength specimens are damaged or missing, the Engineer may allow the Drive Approach(s) to be cored as detailed in the "Specification For Concrete Pavement", per the section titled "Concrete Mixtures Subject to Rejection or Penalty", subsection titled,

SPECIFICATIONS FOR
CONCRETE CURB AND GUTTER

Description

This work shall be in accordance with Division 8, Section 802 of the 2020 MDOT Standard Specifications, except as herein specified.

1. The CONTRACTOR shall be responsible for stripping of topsoil and vegetation and excavation of all materials to the area below the proposed curb and gutter base course.
2. The CONTRACTOR is responsible for the disposal of all topsoil, vegetation, or unsuitable soil from the site. Any suitable material, as determined by the ENGINEER, shall be stockpiled on site and reused as backfill behind the proposed curb and gutter.
3. The CONTRACTOR shall only excavate enough area to properly install the curb and gutter as called for in the plans.
4. The CONTRACTOR shall install a minimum of six inches (6") of 21A aggregate base for the curb and gutter. This base shall extend one foot (1') past the back of curb as shown on the plans.
5. The concrete mix shall be Grade 35 with a cement content of 564 lb./cyd., air entrainment of five and one-half percent (5.5%), with a tolerance of plus or minus one-and-one-half percent (1.5%), and designated to provide 3,500 psi at 28 days.
6. The CONTRACTOR shall backfill behind the curb in order to install the restoration as specified. This backfill can be salvaged material from the excavation of the curb and gutter or approved clay material hauled to the site. Any off-site material must be approved by the ENGINEER prior to placement. Sand and/or rocks two inches (2") in diameter shall not be allowed as backfill material. The backfill must be compacted in place and graded as approved by the ENGINEER.

Construction Methods

Joints are to be laid out as follows:

1. Install expansion joint materials at all points of curvature and every 400 feet.
2. Install expansion joint materials behind the curb at the abutment to sidewalks, drive approaches, and adjacent structures.
3. Place contraction joints every 10 feet along the length of all curbs, gutters and all combination curbs and gutters.
4. All control and expansion joints are to be sealed with hot-poured, elastic-type compound.

SPECIFICATIONS FOR CONCRETE SIDEWALK 6-17-24

Description

This work shall be in accordance with Division 8, Section 803 of the 2020 MDOT Standard Specifications, except as herein specified.

Mix Designs

Design concrete mixtures must meet the requirements of Concrete Grade 4000 specified in Table 1004-1, unless otherwise specified, of the MDOT Standard Specifications for Construction. A variance can be requested in writing and must be approved by the ENGINEER when proposing a mix design that exhibits temperature, slump or air content other than those specified. Do not use a grade of concrete with a minimum specified 28 day compressive strength greater than what is designated for in the application.

The mix shall have an entrained air content of 5.5% to 8.5%, a maximum slump of three (3) inches which can be increased to six (6) inches with a MDOT approved mid-range water reducer and have a minimum 28 day compressive strength of 4000 psi unless otherwise specified.

Mix designs must be submitted to the ENGINEER for review and approval 10 working days before the anticipated date of placement. Mix designs submitted that do not include all of the required documentation will be considered incomplete and returned without review.

Materials

1. The 6AA coarse aggregate shall have a freeze thaw dilation less than 0.040 % per 100 cycles and have a maximum absorption of 2.0%.
2. The maximum slump for concrete is 3 inches unless as otherwise allowed in the approved mix design. The slump can be increased to a maximum of 6" with the addition of a Mid-Range (MR) water reducer listed in the MDOT Quality Assurance Manual at a dosage rate prescribed therein.
3. The maximum water/cementitious materials ratio must not exceed **0.45**. Cementitious materials is defined as the combined weight of all cementitious materials such as cement or ground granulated blast furnace slag (GGBFS).
4. **The concrete mix shall contain 25% - 35% replacement of the Portland cement, or Portland-Limestone cement (Type 1L) with GGBFS (Grade 100 minimum).** A blended cement meeting the requirements of ASTM C 595 containing Portland cement and slag cement (25 - 35%) may be used.
    - 4a. Documentation must be provided for each concrete mix design submitted that the GGBFS is able to control the effects of Alkali Silica Reactivity (ASR). Submit ASTM C 1567 test data using the mix proportions and constituent sources for both the aggregates and the cementitious materials that will be used for the project. The test data should show at least (3) test specimens (mortar bars) for each cementitious materials aggregate combination. If the average of 3 mortar bars for a given cementitious materials aggregate combination produces an expansion less than 0.10 % (rounded to the nearest 0.01%) at 14 days of immersion, the submitted mix design is considered to be non-deleterious to ASR. If the average expansion is 0.10% (rounded to the nearest 0.01%) or greater, the submitted mix design will be considered insufficient to mitigate ASR and will be rejected.

4b. In lieu of ASTM C 1567, test data from ASTM C 1260 or ASTM C 1293 is acceptable. If the data from the ASTM C 1260 test shows the mortar bars to have expanded less than 0.10% (rounded to the nearest 0.01%) at 14 days of immersion the concrete mix will be considered to be non-deleterious to ASR. If the test data ASTM C 1293 test shows the expansion of the concrete prisms is not greater than 0.040% (rounded to the nearest 0.001) after 1 year, the concrete mix will be considered non-deleterious to ASR.

5. Between November 1st and April 1st the concrete mixture(s) must utilize a non-chloride accelerator listed in the MDOT Quality Assurance Manual at a dosage rate prescribed therein.

Miscellaneous

1. If required to meet grade or replace pool soil conditions, the base for all concrete sidewalks shall be 21AA limestone, crushed concrete or blast furnace slag and shall be four inches (4") thick (CIP) and shall be considered incidental to the drive construction.
2. The concrete sidewalks at all new concrete approaches, as called for in the plans, shall be six-inch (6") thick with four-inch (4") thick aggregate base (CIP).
3. Concrete sidewalks, if shown on the plans, shall include handicap ramps per the "Specification for Concrete Handicap Ramps".
4. All expansion joints shall be sealed with a hot-poured elastic-type compound.
5. Where called out for plans, the CONTRACTOR shall strip and dispose of the existing vegetation topsoil, excavate to the required depth for sidewalk and base, and install the base sidewalk as directed by the ENGINEER.

Curing

1. Curing shall be in accordance with Division 6, Section 602 of the 2020 MDOT Standard Specifications, except that or textured surfaces, there shall be one (1) application of curing compound at the rate of one (1) gallon per 150 square feet.

SPECIFICATIONS FOR
CONCRETE ADA SIDEWALK RAMP 6-17-24

Description

This work shall be in accordance with Division 8, Section 803 of the 2020 MDOT Standard Specifications and MDOT Standard Detail R-28-J, except as herein specified.

Mix Designs

Design concrete mixtures must meet the requirements of Concrete Grade 4000 specified in Table 1004-1, unless otherwise specified, of the MDOT Standard Specifications for Construction. A variance can be requested in writing and must be approved by the ENGINEER when proposing a mix design that exhibits temperature, slump or air content other than those specified. Do not use a grade of concrete with a minimum specified 28 day compressive strength greater than what is designated for in the application.

The mix shall have an entrained air content of 5.5% to 8.5%, a maximum slump of three (3) inches which can be increased to six (6) inches with a MDOT approved mid-range water reducer and have a minimum 28 day compressive strength of 4000 psi unless otherwise specified.

Mix designs must be submitted to the ENGINEER for review and approval 10 working days before the anticipated date of placement. Mix designs submitted that do not include all of the required documentation will be considered incomplete and returned without review.

Materials

1. The 6AA coarse aggregate shall have a freeze thaw dilation less than 0.040 % per 100 cycles and have a maximum absorption of 2.0%.
2. The maximum slump for concrete is 3 inches unless as otherwise allowed in the approved mix design. The slump can be increased to a maximum of 6" with the addition of a Mid-Range (MR) water reducer listed in the MDOT Quality Assurance Manual at a dosage rate prescribed therein.
3. The maximum water/cementitious materials ratio must not exceed **0.45**. Cementitious materials is defined as the combined weight of all cementitious materials such as cement or ground granulated blast furnace slag (GGBFS).
4. **The concrete mix shall contain 25% - 35% replacement of the Portland cement, OR Portland-Limestone cement (Type 1L) with GGBFS (Grade 100 minimum).** A blended cement meeting the requirements of ASTM C 595 containing Portland cement and slag cement (25% - 35%) may be used.
    - 4a. Documentation must be provided for each concrete mix design submitted that the GGBFS is able to control the effects of Alkali Silica Reactivity (ASR). Submit ASTM C 1567 test data using the mix proportions and constituent sources for both the aggregates and the cementitious materials that will be used for the project. The test data should show at least (3) test specimens (mortar bars) for each cementitious materials aggregate combination. If the average of 3 mortar bars for a given cementitious materials aggregate combination produces an expansion less than 0.10 % (rounded to the nearest 0.01%) at 14 days of immersion, the submitted mix design is considered to be non-deleterious to ASR. If the average expansion is 0.10% (rounded to the nearest 0.01%) or greater, the submitted mix design will be considered insufficient to mitigate ASR and will be rejected.

4b. In lieu of ASTM C 1567, test data from ASTM C 1260 or ASTM C 1293 is acceptable. If the data from the ASTM C 1260 test shows the mortar bars to have expanded less than 0.10% (rounded to the nearest 0.01%) at 14 days of immersion the concrete mix will be considered to be non-deleterious to ASR. If the test data ASTM C 1293 test shows the expansion of the concrete prisms is not greater than 0.040% (rounded to the nearest 0.001) after 1 year, the concrete mix will be considered non-deleterious to ASR.

5. Between November 1st and April 1st the concrete mixture(s) must utilize a non-chloride accelerator listed in the MDOT Quality Assurance Manual at a dosage rate prescribed therein.

Miscellaneous

1. If required to meet grade or replace poor soil conditions, the base for all concrete sidewalks shall be 21AA crushed concrete, crushed limestone or blast furnace slag and shall be four inches (4") thick (CIP) and shall be considered incidental to the drive construction.
2. The concrete sidewalks for handicap ramps shall be seven (7) inches in thickness.
3. All expansion joints shall be sealed with a hot-poured elastic-type compound.
4. Where called out for plans, the CONTRACTOR shall strip and dispose of the existing vegetation topsoil, excavate to the required depth for sidewalk and base, and install the base sidewalk as directed by the ENGINEER.
5. Detectable warnings shall be placed at all handicap ramps at a minimum five (5) foot in width and two (2) foot in length, brick red in color and shall be tiles manufactured by Armor-Tile or approved equal.
6. Ramps and placement of detectable warnings shall be constructed per the current Americans with Disabilities Act standards.

Curing

1. Curing shall be in accordance with Division 6, Section 602 of the 2020 MDOT Standard Specifications, except that or textured surfaces, there shall be one (1) application of curing compound at the rate of one (1) gallon per 150 square feet.

SPECIFICATIONS FOR
MAINTENANCE AGGREGATE

Description

The work to be performed under this item includes the furnishing, placing, compacting and maintenance of temporary approaches or access strips to provide ingress/egress for the public to residential or commercial driveways or for traffic movements through local side streets until the final trimming of the pavement aggregate base course takes place.

Materials

The material to be used shall be clean, approved 21A, 21AA, 22A, or 23A blast furnace slag or limestone, or 21A, 21AA or 22A Recycled Asphalt Pavement (RAP).

Construction Method

The work shall be performed in accordance with Division 3, Section 306 of the 2020 MDOT Standard Specifications for Construction and as directed in the field by the ENGINEER.

Maintenance Aggregate is not considered to be 21AA aggregate base course and must be removed prior to placement of the aggregate base course unless otherwise directed by the ENGINEER.

SPECIFICATIONS FOR
POLYUREA PAVEMENT MARKINGS

Description

The work shall consist of installing and providing a performance warranty for reflectorized white and yellow two-component, 100 percent solids polyurea pavement markings. Preparation of pavement surfaces and application of lines, legends, symbols, crosswalks and stop lines shall be in accordance with the Project Plans, Standard Specifications for Construction and as directed by the ENGINEER.

Materials

The material manufacturer shall furnish a notarized certification that the material complies with the provisions of this specification.

The material shall be shipped to the job site in sturdy containers plainly marked with the manufacturer's name and address, the color of the material, date of manufacture and batch number.

All polyurea pavement marking material must be selected from the MDOT Qualified Products List (QPL).

The type, gradation and loading rates of the glass beads shall be determined by the polyurea manufacturer and shall be sufficient to meet the retroreflectivity requirements as described in the special provision.

Construction Method

Placement

All polyurea materials and glass beads shall be placed according to the polyurea binder manufacturer's requirements. The binder manufacturer shall provide all technical data regarding material type and application rate to the ENGINEER prior to starting work.

Pavement Marking CONTRACTORS and/or equipment may be qualified as follows:

1. If the CONTRACTOR has no experience in polyurea applications, they must contact the MDOT, Traffic and Safety Statewide Traffic specialist at (517) 335-2859 for a field demonstration.
2. If the CONTRACTOR has experience has experience in polyurea applications with other state transportation departments, they must provide the MDOT, Pavement Marking ENGINEER, Traffic Control Devices, 425 Ottawa, Lansing, MI 48909; (517) 373-3340, Traffic and Safety with an experience summary and contact names for verification of their experience.
3. New or non-certified Striping equipment must be certified by the MDOT, Traffic and Safety Statewide Traffic Specialist (517) 335-2859, prior to use.

Surface Preparation

The surface must be cleaned to remove all existing debris, latence, curing compound and other contaminants that may hinder the adhesion of the system to the surface. All existing non-polyurea pavement marking materials shall be removed prior to placement of any polyurea materials.

If grinding, scarifying, sandblasting, shot blasting, or other operations are performed, the debris generated must be contained through vacuum-type equipment or equivalent and the work shall be

conducted in such a manner that the finished pavement surface is not damaged nor exhibits a pattern that will mislead or misdirect the motorist.

When these operations are completed, the pavement surface shall first be power broomed and then blown off with compressed air to remove residue and debris resulting from the cleaning work. Removal and cleaning work shall be conducted in such a manner as to control and minimize airborne dust and similar debris, so as to prevent a hazard to motor vehicle operation or nuisance to adjust property.

Care shall be taken on bituminous and Portland cement concrete surface when performing removal and cleaning work to prevent damage to transverse and longitudinal joint sealers.

Temperature Limitations

The pavement surface where the polyurea is to be placed shall have a minimum temperature of 40 degrees Fahrenheit and rising during marking operations. The ambient temperature shall also be 40 degrees Fahrenheit and rising. The pavement surface temperature and air temperature shall be measured and documented before the start of each day of marking operation and at any other time deemed necessary by the ENGINEER.

Application Rates

Rates may be checked by the ENGINEER by comparing tallies of materials used to the lengths of lines placed. For initial application and occasionally during the course of work, the ENGINEER may also check application to a pre-weighed sheet specifically placed for test purposes. Drop-in spheres shall not be applied for this test.

Dry Time

When installed at or above 40 degrees Fahrenheit, the material shall be track free in under 10 minutes.

Long Line Markings		
TABLE 1: Minimum Retroreflectivity Values (mcd/m^2/lum) (1)		
TIME	**White Markings**	**Yellow Markings**
(Minimum 30 days after installation)	350	250
(1) milli-candelas per square meter lux		

SPECIFICATIONS FOR
ADJUSTING STRUCTURES

Description

This work shall be in accordance with Division 4, Section 403 of the 2020 MDOT Standard Specifications, except as herein specified.

1. This item shall include all structures, which are raised or lowered to a specified vertical height. This includes, but is not limited to, manholes, catch basins, inlets, gate wells and stop boxes.
2. If the plans call for providing new frame and covers, all existing frame and covers shall be picked up by the Township of Brownstown Department of Public Services or as directed by the ENGINEER.
3. The work under this item shall provide for a change in elevation of up to 12 inches, measured vertically from the top of the masonry or concrete structure, and shall include repairs to the existing structure within this limit. If the structure needs additional repairs beyond the limit set forth, the CONTRACTOR must obtain approval from the ENGINEER prior to completing any additional repairs to the structure.
4. The CONTRACTOR is responsible to clear out all structures as directed by the ENGINEER, prior to completing any repairs or adjustment to the structure.
5. All catch basins, manholes, gate wells and inlets shall be kept thoroughly cleaned of silt, debris and foreign matter and shall be free from such accumulations at the time of final acceptance.
6. The CONTRACTOR is responsible for adjusting all structures within the project area to the final grade or as directed by the ENGINEER. This includes, but is not limited to, manholes, catch basins, inlets, gatewells and stop boxes.
7. The CONTRACTOR shall install an edge drain, as illustrated by the standard plan S-14, at each catch basin or inlet structure that is not removed and replaced.
8. Equipment will not be permitted to operate over adjusted structures any sooner than 24 hours after their completion, unless otherwise approved by the ENGINEER.

SPECIFICATIONS FOR
RECONSTRUCTING STRUCTURES

Description

This item shall include all structures that are raised or lowered to a specified vertical height. This includes, but is not limited to, manholes, catch basins, inlets, gate wells and stop boxes.

Where called for on the plans, or as authorized by the ENGINEER, existing structures shall be reconstructed to the required line and elevation to essentially conform to the details on the plans for standard structures. If the plans call for providing new frame and covers, all existing frame and covers shall be removed and replaced at the CONTRACTOR's expense.

All catch basins, manholes, gate wells and inlets shall be kept thoroughly cleaned of silt, debris and foreign matter and shall be free from such accumulations at the time of final acceptance.

The CONTRACTOR is responsible for adjusting all structures within the project area to the final grade or as directed by the ENGINEER. This includes, but is not limited to, manholes, catch basins, inlets, gatewells and stop boxes.

All storm manholes and catch basins shall have a geotextile fabric wrapped around the brick and mortar. The fabric shall be a non-woven geotextile meeting the minimum ASTM requirements for geotextile blanket as established by MDOT, Section 910.

SPECIFICATIONS FOR
DRAINAGE STRUCTURES

Description

This work shall be in accordance with Division 4, Section 403 of the 2020 MDOT Standard Specifications, except as herein specified.

1. As part of the removal operation, the CONTRACTOR shall remove and replace the first section of sewer pipe from the structure to the first pipe joint.
2. All new drainage structures shall have precast sections unless otherwise approved by the ENGINEER.
3. The CONTRACTOR shall follow the construction details of the structures and backfilling requirements as shown on the Standard Details, except as stated herein.
4. Backfilling around structures shall not begin any sooner than 12 hours after the structure has been completed, except precast structures that may be backfilled immediately. In all cases, structures shall be approved by the ENGINEER prior to backfilling. The backfill material (MDOT Class II Granular Material) shall be deposited evenly around the structures as described in this Specification.
5. Structure excavations under road surfaces, pavement, shoulders, sidewalk, curb, driveways and where the edge of the excavation is within three feet (3') of the pavement shall be compacted to 95% of its Maximum Unit Weight.
6. The CONTRACTOR is responsible for connecting any existing sewer or proposed sewer to the new pipe, of similar material, to the existing pipe and installing the new section into the structure in accordance with the Storm Sewer Standard Details. The connection of the new section of pipe to the existing pipe must be approved by the ENGINEER prior to the backfilling above the connection.
7. All other structure excavations shall be backfilled as above, except that the 21AA crushed limestone or blast furnace slag shall be placed a minimum of five feet (5') from the outside wall of all structures and shall be carried to within one-and-one half feet (1½') of finished grade. The remaining one-and-one half feet (1½') of backfill shall be suitable excavated material as approved by the ENGINEER.
8. The CONTRACTOR shall install an edge drain, as illustrated by the standard plan S-14, at each catch basin or inlet structure.
9. The CONTRACTOR is responsible for placement of any temporary pavement to maintain traffic flow after the installation of the sewer. The actual areas where the temporary pavement will be installed will be determined by the ENGINEER.

SPECIFICATIONS FOR
STORM SEWERS

Description

This work shall include, but is not necessarily limited to, the furnishing and installation of all storm sewers, wyes, house leads and connections as indicated on the plans and as necessary for the proper and complete performance of the work.

Any possible inconsistencies that may exist between the requirements included herein and the requirements of either the Department of Public Works for work under their jurisdiction, will be resolved by the ENGINEER at the time such inconsistency is identified.

1. The contract unit price per linear foot for installing storm sewers shall include excavation and backfilling as shown in the plans.
2. All sewer joints shall be sealed with flexible watertight rubber O-ring gaskets. The CONTRACTOR shall connect to existing storm sewers as shown on the plans.
3. The CONTRACTOR is responsible for placement of any temporary pavement will be installed will be determined by the ENGINEER.
4. When storm sewer is being used for a roadway culvert, the CONTRACTOR shall install flared-end sections as called for in the plans.

Definition

1. A public storm sewer is defined as any storm sewer where there are two (2) or more connections to that sewer.
2. Building Taps and Service Leads: A separate building tap and service lead shall be provided at each building tap and service lead shall be provided at each building or dwelling.
3. Submittals: Submit all shop drawings, product data and samples as determined by the ENGINEER.

Materials

Sewer Pipe

1. Poly Vinyl Chloride Pipe (PVC): PVC pipe in size six inches (6") but less than twelve inches (12") shall be, at a minimum, ASTM D-3034 and SDR-26 or as otherwise approved by the ENGINEER. PVC pipe twelve inches (12") and larger shall be seamless with a corrugated annular exterior and smooth interior with an integral bell-gasketed (AASHTO) soil tight joint. The PVC pipe and fittings shall be manufactured and tested in accordance with ASTM F-949. The Manning's "n" value for use in design shall be 0.009. PVC pipe material shall be 12454 cell class material per ASTM D 1784. Pipe and fittings shall have a minimum pipe stiffness of 46 lbs./in./in. when tested in accordance with ASTM D 2412. An acceptable PVC pipe is Contech A-2000 PVC pipe or equivalent approved by the ENGINEER.
2. Reinforced Concrete Pipe (RCP) — For depths to twenty three feet (23'), RCP ASTM C 76 Class IV shall be utilized. For depths greater than twenty three feet (23') to thirty three feet (33') ASTM C 76 Class V shall be utilized. For depths greater than thirty three feet (33') a special design will be required and must be submitted to the ENGINEER for approval. All joints shall be of the modified tongue and groove type. Compression-type O-ring rubber gaskets shall be used in the joints and shall conform to ASTM C-443. Only lubricant as supplied by the pipe manufacturer shall be used. Joints for all storm sewer 30 inches and larger shall be inside cement pointed.

3. High Density Polyethylene (HDPE) Pipe — HDPE pipe twelve inches (12") to sixty inches (60") shall be dual wall with a corrugated annular exterior and smooth interior with a bell and spigot joint meeting the requirements of ASTM F 2306, and a rubber gasket meeting ASTM F 477. All fittings shall meet ASTM F 2306. The Manning's "n" value for design shall be 0.012. The material shall consist of virgin and recycled high density polyethylene meeting the requirements of 435420C (ECSR Test Condition B) of ASTM D 3350 with the exception that the carbon black content shall not exceed 4%. Acceptable HDPE pipe would be Hancor Sure-Lok WT pipe, ADS N-12 smooth interior pipe, or an equal approved by the ENGINEER.
4. Drainage Structures — All work associated with installing Drainage Structures shall be in accordance with the Wayne County Standard Specifications for Drainage Structures.

Construction Methods

1. Push-On Joints — Joints shall be made by means of a compression-type push-on resilient gasket. Gasket shall be pre-lubricated before installation using a lubricant recommended by the pipe manufacturer. The seated joint shall be identified by the visible mark on the spigot of the installed pipe section. When the temperature is above 60 degrees Fahrenheit, the spigot end of each pipe shall be forced tightly on the bell of the preceding pipe. When the temperature is below 60 degrees Fahrenheit, the pipe shall be laid with the spigot end one-sixteenths inch (1/16") from the face of the bell for expansion.

Surface Conditions

Inspection

1. Verify that all work under this section may be installed in accordance with all pertinent codes and regulations, the original design, and the referenced standards.
2. All materials shall be inspected immediately before installation and, if found defective, marked "Rejected" and removed from the site.

Discrepancies

1. In the event of discrepancy, immediately notify the ENGINEER.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

Earthwork

All earth work required for the performance of the work of this section shall be done in accordance with the Wayne County Standard Specification for Earthwork.

Installation

Install all pipe and fittings in strict accordance with the manufacturer's recommendations as approved by the ENGINEER.

Handling

1. Pipe and materials shall be distributed at the site as required and care shall be exercised to prevent injury to the pipe and materials during handling.
2. Provide and use proper tools and implements as approved by the ENGINEER for safety handling the pipe and other materials.
3. Protect the pipe and other materials from falling to the ground or into the trench.
4. Keep distributed pipe and materials clear from danger or damage to passing vehicles.

Laying Pipe

1. Lay all pipe true to line and grade with pipe ends abutting each other and the bell end facing the direction of laying.

2. Use laser alignment equipment to establish and maintain proper line and grade.
3. Correct any deviation from line and grade at no additional cost to the OWNER.

Miscellaneous Items

1. All miscellaneous items not specifically mentioned shall be installed as per standard practice or manufacturer's recommendations, whichever are more stringent.
2. Relocation of any utility not specifically called for on the plans but required to properly perform the work shall be the CONTRACTOR's responsibility and shall be relocated at no additional expense to the OWNER.
3. Wherever existing manholes or sewer pipes are to be tapped, machine core the manhole and install a rubber boot with stainless steel bands. Use Kor-N-Seal with Korband external contraction bands or approved equal.

SPECIFICATIONS FOR RESTORATION

Description

This special provision covers the requirements for Restoration for this project. This work shall consist of shaping all disturbed areas, placing topsoil, seed or sod, fertilizer, mulch blanket or mulch, anchoring mulch and as sown on plans and typical cross sections. Restoration shall be in accordance with Division 8, Sections 813 and 816 and Division 9, Section 917 of the 2020 MDOT Standard Specifications and as directed by the ENGINEER with the following exceptions and additions.

Any possible inconsistencies that may exist between the requirements included herein and the requirements of MDOT 2020 Standard Specifications for Construction will be resolved by the ENGINEER at the time such inconsistency is identified.

Classification

Seeding will be classified as Class A or Class B depending on the type of soil and the area to be seeded.

Class of Seeding	Intended Use (For the guidance of the user and not a part of these specifications)	Commercial Fertilizer (Lb/Acre)	**Sowing** Mixture No.	**Seeds** Rate, Lb. Per Acre
A	Lawns, Boulevards, and Parks	1200 Lb. Chemical	1 or 2	80
B	General Seeding on Primary and Local Roads	1200 Lb. Chemical	3 or 4	50

Seed Mixtures

Seed mixtures shall be certified seed of the following purity, germination and proportions by weight, as specified in the following table:

SEEDS			MIXTURES			
Kind	Purity	Germination	Class A Seeding		Class B Seeding	
			No. 1	No. 2	No. 3	No. 4
Kentucky Blue Grass	85%	80%	80%	40%	50%	30%
Creeping Red Fescue	98%	90%		30%		30%
Red Top	96%	90%	20%	15%	10%	10%
Perennial Rye Grass	98%	90%		15%	40%	10%
Tall Fescues	98%	90%	When Specified			
Bent Grasses	98%	90%				
White Dutch Clover	98%	90%				
Alsike Clover	98%	90%				
Type of Soil			Heavy and Medium Soils	Light Soils	Heavy and Medium Soils	Light Soils
Intended Use (For the guidance of the user and not a part of these Specifications)			Lawns, Boulevards and Park Areas		Gen. Seeding on Primary & Local Roads	

*Germination percentages may include a maximum tolerance of hard seed as follows:

Alsike Clover…… 30% hard seed

White Dutch Clover……... 15% hard seed

Materials

Seeding

1. The seeding mixture shall be Class A, Type 1 seeding for lawns, boulevards, and park areas.
2. All seed proposed to be used shall be furnished in durable cloth bags, tagged or labeled, showing the date of test and guarantee of analysis of purity and germination, and shall meet the requirements of these specifications.
3. Seed shall be the previous year's crop, and in no case shall exceed one percent (1%) weed content. No seed will be accepted with date of the test of more than six (6) months prior to the date of sowing, and the Township reserves the right to test, reject or approve all seed.

Topsoil

1. Topsoil furnished maybe visually inspected for organic contamination and cleanliness at the source by the ENGINEER prior to transport to the construction site.
2. Topsoil furnished shall not be contaminated and shall not be a mixture of natural underlying soils, subbase material or other materials. It shall consist of natural loam or clay loam

humas-bearing soils adapted to the sustenance of plant life and such soils shall be neither excessively acid nor excessively alkaline.

3. Topsoil furnished shall come from sources furnished by the CONTRACTOR from off the project.
4. Topsoil furnished shall be spread to a depth of not less than three inches (3”), unless otherwise indicated on the plans.

Sodding

1. Sodding shall be Class A with densely rooted blue grass other approved perennial grass, free from noxious weeds and reasonably free from other weeds.
2. Sodding shall be not less than two inches (2”) thick, cut in strips not less than 10 inches wide by 18 inches long.
3. The type of sodding shall match the existing lawn or as approved by the ENGINEER.

Fertilizer

1. Commercial fertilizer shall be used for seeding and shall consist of chemical fertilizers.
2. These shall be of standard approved brands ad shall be delivered in bags not to exceed 100 pounds each.
3. The guaranteed analysis shall be shown on each bag.
4. Chemical fertilizer for grasses shall contain six percent (6%) available nitrogen, 12 percent available phosphoric acid, and 12 percent available potash unless otherwise specified. The nitrogen element shall be derived at least 10-20 percent from true organic materials (such as tobacco stems, cottonseed meal, sewage sludge or tankage), at least 20 percent from urea compounds and the balance from other nitrogen materials.

Construction Methods

Preparation of Earth Bed

1. The earth bed upon which the furnished topsoils are placed shall be at the required grade and properly trimmed.
2. Prior to placing the furnished topsoil, the earth bed shall be worked into a friable condition to a minimum depth of three inches (3”) and all sprinkler heads or monument boxes must be adjusted or relocated.
3. Earth beds shall be harrowed with a disk, a spring tooth drag or a spike tooth drag just prior to lacing any topsoil. The harrowing shall be done so that all soil impressions left by any equipment are horizontal across the face of the slope.
4. Any topsoil that has been placed on conditional earth bed shall be incorporated into the upper two inches of the earth bed.
5. Furnished topsoils shall not be worked when in a wet condition. Working wet soil destroys the soil structure and causes compaction that inhibits root growth.
6. The topsoils shall be spread on the prepared areas to a depth of not less than three inches (3”). After spreading, any large clods and lumps shall be pulverized and all stones and rocks more than two inches (2”) in diameter, roots, litter or any foreign matter shall be raked up and disposed of by the CONTRACTOR off the site as described in Division 8, Section 816 of the 2020 MDOT Standard Specifications.
7. The topsoil surface shall be in reasonably close conformity to the lines, grades and cross sections shown on the plans.
8. Where called for on the plans, pea gravel is to be installed and compacted in place.

Sodding

1. The sod shall be moist, laid in a moist earth bed and within 24 hours after cutting and properly protected until placed.

2. Pitchforks shall not be used to handle the sod and dumping from vehicles will not be permitted.
3. The sod shall not be placed during a drought or during the period from July 1 to August 15.
4. The sod shall be kept moist by the CONTRACTOR for 30 days or until growth has been established.

Seeding

1. The actual sowing of seed shall be performed from the time the ground is workable in the spring until June 1 and between the dates of August 15 and October 1, except during periods of high winds. Sowing at any other time shall be by special authorization.
2. The seed mixture of the kind required shall be sown at the rate per acre specified above for the classes of seeding specified.
3. The seed shall be incorporated in the soil to a depth not to exceed one-quarter inch (¼"), using a Brillion seeder or other suitable equipment.
4. Seeds shall not be sown through mulch.

Watering

1. Use a minimum of 27 gallons of water to establish each square yard of sod. Within eight hours after the sod has been placed, spray 6 gallons of water per square yard; apply 3.5 gallons per square yard five additional times at three to four day intervals. The engineer may require additional applications based on the season and weather conditions.
2. Use a minimum of 17.5 gallons of water to establish each square yard of seeded area. Water seeded areas at 3.5 gallons per square yard thereafter. Continue watering regularly so that seed/seedlings do not dry out.

SPECIFICATIONS FOR
PROJECT CLEANUP

Description

This work shall be as specified in Division 2, Section 209 of the 2020 MDOT Standard Specifications, expect as herein specified.

Any item, which is not included as part of any other pay item, that is disturbed or damaged, as part of the construction operations, will have to be restored back to its original condition as directed by the ENGINEER. These items include, but are limited to, sprinkler systems and traffic signs.

SPECIFICATIONS FOR
IDLED EQUIPMENT

Description

This work shall be as specified as shown below.

1. No additional compensation will be given to the CONTRACTOR for not being prepared and having the correct materials on site during the installation of the utilities including the water main and storm sewer.
2. It is the CONTRACTOR's responsibility to have all necessary fittings, restrained joints, bolts, adjustment rings, etc. in order to complete the job as shown on the plans.
3. In the unlikely event that the CONTRACTOR claims Idled Equipment the ENGINEER shall review the claim with the OWNER to determine if the claim is warranted.

SPECIFICATIONS FOR
SPRINKLER SYSTEM REPAIRS

Description:
This item shall include the replacement and/or repairs of sprinkler lines or sprinkler systems that may have been damaged during the course of construction.

As part of the notice to residents regarding upcoming construction, residents will be asked to mark sprinkler head locations within the ROW as several existing systems may not be known by the Township of Brownstown. It is also understood that not all residents may comply with this requirement. Therefore, it is essential that the CONTRACTOR identify sprinkler systems marked by residents in addition to identifying other sprinkler systems that may exist to prevent damage during excavation.

If, however, sprinkler systems are damaged during construction, the CONTRACTOR must furnish parts and replace or repair damaged sprinkler systems to the same or better condition than what existed prior to construction. The cost of sprinkler system repairs will not be a separate pay item; however, will be incidental to the cost of construction.

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Underground feeder and branch-circuit cable.

C. Wiring connectors.

D. Electrical tape.

E. Heat shrink tubing.

F. Oxide inhibiting compound.

G. Wire pulling lubricant.

H. Cable ties.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 312316 - Excavation.

E. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

F. Section 312323 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2024).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2024.

F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

I. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

L. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

M. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

N. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

O. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

P. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

Q. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Sustainable Design Documentation: Submit manufacturer's product data on conductor and cable showing compliance with specified lead content requirements.

D. Wire Pulling Lubricant: Certification of compatibility with conductors/cables.

E. Field Quality Control Test Reports.

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

G. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

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

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

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

1.07 DELIVERY, STORAGE, AND HANDLING

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

1.08 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Underground feeder and branch-circuit cable is not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 260526.

H. Conductor Material:
   1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.

I. Minimum Conductor Size:
   1. Branch Circuits: 12 AWG.
      a. Exceptions:
         1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
         2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
         3) 20 A, 277 V circuits longer than 150 feet (46 m): 10 AWG, for voltage drop.

J. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

K. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
   3. Color Code:
      a. 208Y/120 V, 3 Phase, 4 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
         4) Neutral/Grounded: White.
      b. Equipment Ground, All Systems: Green.
      c. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
   1. Copper Building Wire:

a. Cerro Wire LLC: www.cerrowire.com/#sle.
b. Encore Wire Corporation: www.encorewire.com/#sle.
c. General Cable Technologies Corporation; _____: www.generalcable.com/#sle.
d. Southwire Company: www.southwire.com/#sle.
e. Substitutions: See Section 016000 - Product Requirements.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
1. Feeders and Branch Circuits:
a. Size 10 AWG and Smaller: Solid.
b. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
1. Copper Building Wire: Type THHN/THWN, THHN/THWN-2, or XHHW-2, except as indicated below.
a. Size 4 AWG and Larger: Type XHHW-2.
b. Installed Underground: Type XHHW-2.

2.04 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 260526.

C. Wiring Connectors for Splices and Taps:
1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:
1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.

E. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
1. Manufacturers:
a. 3M: www.3m.com/#sle.
b. Ideal Industries, Inc: www.idealindustries.com/#sle.
c. NSI Industries LLC: www.nsiindustries.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

F. Mechanical Connectors: Provide bolted type or set-screw type.
1. Manufacturers:
a. Burndy LLC; _____: www.burndy.com/#sle.

b. nVent ILSCO: www.ilsco.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

G. Compression Connectors: Provide circumferential type or hex type crimp configuration.
1. Manufacturers:
a. Burndy LLC; _____: www.burndy.com/#sle.
b. nVent ILSCO: www.ilsco.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

H. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
1. Manufacturers:
a. Burndy LLC; _____: www.burndy.com/#sle.
b. Ilsco: www.ilsco.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

2.05 ACCESSORIES

A. Electrical Tape:
1. Manufacturers:
a. 3M: www.3m.com/#sle.
b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.
c. Substitutions: See Section 016000 - Product Requirements.
2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
a. Substitutions: See Section 016000 - Product Requirements.
3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
a. Substitutions: See Section 016000 - Product Requirements.
4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
a. Substitutions: See Section 016000 - Product Requirements.
5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
a. Substitutions: See Section 016000 - Product Requirements.
6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil (0.18 mm); suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
a. Substitutions: See Section 016000 - Product Requirements.
7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
a. Substitutions: See Section 016000 - Product Requirements.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
1. Manufacturers:

a. 3M: www.3m.com/#sle.
b. Burndy LLC; _____: www.burndy.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
1. Manufacturers:
a. Burndy LLC; _____: www.burndy.com/#sle.
b. Ideal Industries, Inc: www.idealindustries.com/#sle.
c. Ilsco: www.ilsco.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

D. Wire Pulling Lubricant:
1. Manufacturers:
a. 3M: www.3m.com/#sle.
b. American Polywater Corporation: www.polywater.com/#sle.
c. Ideal Industries, Inc: www.idealindustries.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.
2. Listed and labeled as complying with UL 267.
3. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
4. Suitable for use at installation temperature.
5. Products:
a. American Polywater Corporation; Polywater J Cable Pulling Lubricant: www.polywater.com/#sle.
b. American Polywater Corporation; Polywater LZ Cable Pulling Lubricant: www.polywater.com/#sle.
c. Substitutions: See Section 016000 - Product Requirements.

E. Cable Ties: Material and tensile strength rating suitable for application.
1. Manufacturers:
a. Burndy LLC; _____: www.burndy.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

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

3.03 INSTALLATION

A. Circuiting Requirements:
1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.

5. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
    a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
    b. Increase size of conductors as required to account for ampacity derating.
    c. Size raceways, boxes, etc. to accommodate conductors.
6. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Installation in Raceway:
1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

G. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

H. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

I. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

J. Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

K. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

L. Insulate ends of spare conductors using vinyl insulating electrical tape.

M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

N. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
   1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground rod electrodes.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

C. Section 265600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2025.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

C. Field quality control test reports.

D. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

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

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

D. Installer Qualifications for Signal Reference Grids: Company with minimum five years documented experience with high frequency grounding systems.

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

1.06 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
   3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

E. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
   2. Ground Rod Electrode(s):
      a. Provide single electrode unless otherwise indicated or required.
      b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
   3. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

F. Pole-Mounted Luminaires: Also comply with Section 265600.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled as suitable for the purpose intended.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
   1. Use insulated copper conductors unless otherwise indicated.
      a. Exceptions:
         1) Use bare copper conductors where installed underground in direct contact with earth.
         2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
   3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
   4. Manufacturers - Mechanical and Compression Connectors:

a. allG Fabrication; _____: www.allgfab.com/#sle.
b. Burndy LLC; _____: www.burndy.com/#sle.
c. Harger Lightning & Grounding; _____: www.harger.com/#sle.
d. nVent ERICO; _____: www.nvent.com/#sle.
e. Thomas & Betts Corporation; _____: www.tnb.com/#sle.
f. Substitutions: See Section 016000 - Product Requirements.

5. Manufacturers - Exothermic Welded Connections:
a. Burndy LLC; _____: www.burndy.com/#sle.
b. nVent ERICO; Cadweld: www.nvent.com/#sle.
c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC; _____: www.thermoweld.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

D. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.
4. Manufacturers:
a. allG Fabrication; _____: www.allgfab.com/#sle.
b. Galvan Industries, Inc; _____: www.galvanelectrical.com/#sle.
c. Harger Lightning & Grounding; _____: www.harger.com/#sle.
d. nVent ERICO; _____: www.nvent.com/#sle.
e. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches (150 mm) below finished grade.

D. Make grounding and bonding connections using specified connectors.
1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications: Materials and requirements for fabricated metal supports.

B. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

C. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

D. Section 265600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems.

C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

D. Installer's qualification statement.

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

1.05 QUALITY ASSURANCE

A. Maintain at project site one copy of each referenced document that prescribes execution requirements.

B. Installer Qualifications for Powder-Actuated Fasteners: Certified by fastener system manufacturer with current operator's license.

C. Installer Qualifications for Field Welding: See Section 055000.

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

1.06 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. NFPA 70.
      b. Requirements of authorities having jurisdiction.
   2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
   3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported _____. Include consideration for vibration, equipment operation, and shock loads where applicable.
   5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
      a. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
      b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
   1. Manufacturers:
      a. ABB: www.electrification.us.abb.com/#sle.
      b. Eaton Corporation: www.eaton.com/#sle.
      c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
      d. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
      e. Substitutions: See Section 016000 - Product Requirements.
   2. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   3. Conduit Clamps: Bolted type unless otherwise indicated.
   4. Products:
      a. Gripple, Inc; Universal Bracket: www.gripple.com/#sle.
      b. Gripple, Inc; Fast Trak: www.gripple.com/#sle.
      c. Gripple, Inc; Universal Clamp (Threaded): www.gripple.com/#sle.
      d. Gripple, Inc; Low Profile Bracket Kits: www.gripple.com/#sle.
      e. Substitutions: See Section 016000 - Product Requirements.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
   1. Manufacturers:
      a. ABB: www.electrification.us.abb.com/#sle.
      b. Eaton Corporation: www.eaton.com/#sle.
      c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
      d. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
      e. Substitutions: See Section 016000 - Product Requirements.

D. Metal Channel/Strut Framing Systems:
   1. Manufacturers:
      a. ABB: www.electrification.us.abb.com/#sle.
      b. Atkore International Inc; Unistrut: www.unistrut.us/#sle.

c. Eaton Corporation: www.eaton.com/#sle.
d. Elgen Manufacturing Company, Inc; _____: www.elgenmfg.com/#sle.
e. Substitutions: See Section 016000 - Product Requirements.

2. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
3. Comply with MFMA-4.
4. Channel/Strut Used as Raceway, Where Indicated: Listed and labeled as complying with UL 5B.
5. Channel Material:
   a. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
6. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
7. Minimum Channel Dimensions: 1-5/8 inch (41 mm) wide by 13/16 inch (21 mm) high.

E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
   a. Equipment Supports: 1/2-inch (13 mm) diameter.
   b. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch (6 mm) diameter.
   c. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch (10 mm) diameter.
   d. Trapeze Support for Multiple Conduits: 3/8-inch (10 mm) diameter.
   e. Outlet Boxes: 1/4-inch (6 mm) diameter.

F. Anchors and Fasteners:
1. Manufacturers - Mechanical Anchors:
   a. Dewalt: anchors.dewalt.com/#sle.
   b. Hilti, Inc: www.hilti.com/#sle.
   c. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com/#sle.
   d. MKT Fastening: www.mktfasteningusa.com/#sle.
   e. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.
   f. _____.
   g. Substitutions: See Section 016000 - Product Requirements.
2. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
3. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
4. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
   a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
   b. Comply with MFMA-4.
   c. Channel Material: Use galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

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

B. Install hangers and supports in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
   1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
   2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

I. Secure fasteners in accordance with manufacturer's recommended torque settings.

J. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 260533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. PVC-coated galvanized steel rigid metal conduit (RMC).

C. Rigid polyvinyl chloride (PVC) conduit.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 078400 - Firestopping.

C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.

D. Section 260526 - Grounding and Bonding for Electrical Systems.
   1. Includes additional requirements for fittings for grounding and bonding.

E. Section 260529 - Hangers and Supports for Electrical Systems.

F. Section 260533.16 - Boxes for Electrical Systems.

G. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

H. Section 312316 - Excavation.

I. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

J. Section 312323 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2025.

B. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2025.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.

E. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2025.

F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

G. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.

H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

L. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

M. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

N. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

O. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
   4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

C. Project Record Documents: Record actual routing for conduits installed underground and conduits 2-inch (53 mm) trade size and larger.

1.06 QUALITY ASSURANCE

A. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.

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

1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit (RMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
   2. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC) or schedule 80 rigid PVC conduit where emerging from underground.
   3. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows or concrete-encased PVC elbows for bends.

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Fittings for Grounding and Bonding: See Section 260526 for additional requirements.

C. Provide conduit, fittings, supports, and accessories required for complete raceway system.

D. Provide products listed, classified, and labeled as suitable for purpose intended.

E. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 3/4-inch (21 mm) trade size.
   2. Branch Circuit Homeruns: 3/4-inch (21 mm) trade size.
   3. Underground, Exterior: 1-inch (27 mm) trade size.

F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
   1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
   2. Nucor Tubular Products: www.nucortubular.com/#sle.
   3. Rymco USA: www.rymcousa.com/#sle.
   4. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
   5. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:
   1. Manufacturers:
      a. ABB; T&B: www.electrification.us.abb.com/#sle.
      b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
      c. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
      d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
      e. Substitutions: See Section 016000 - Product Requirements.
   2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
   3. Material: Use steel or malleable iron.
   4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

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

A. Manufacturers:
   1. ABB; Ocal: www.electrification.us.abb.com/#sle.
   2. Calbond, a division of Atkore International www.calbond.com/#sle
   3. Robroy Industries: www.robroy.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

C. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch (1.02 mm).

D. PVC-Coated Boxes and Fittings:
   1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
   2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
   3. Material: Use steel or malleable iron.
   4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch (1.02 mm).

E. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch (0.38 mm).

2.05 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:
   1. ABB; Carlon: www.carlon.com/#sle.
   2. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
   3. Cantex Inc: www.cantexinc.com/#sle.
   4. Heritage Plastics, a division of Atkore International: www.heritageplastics.com/#sle.
   5. JM Eagle: www.jmeagle.com/#sle.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

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

B. Install conduit in accordance with NECA 1.

C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.

D. PVC-Coated Galvanized Steel Rigid Metal Conduit (RMC): Install using only tools approved by manufacturer.

E. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.

F. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated without specific routing, determine exact routing required.
   3. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
   4. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
   5. Arrange conduit to provide no more than 150 feet (46 m) between pull points.

G. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

H. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
5. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
6. Secure joints and connections to provide mechanical strength and electrical continuity.

I. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.

J. Underground Installation:
1. Provide trenching and backfilling; see Section 312316 and Section 312323.
2. Minimum Cover, Unless Otherwise Indicated or Required:
   a. Underground, Exterior: 18 inches (460 mm).
3. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 260553.

K. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches (76 mm) on all sides unless otherwise indicated; see Section 033000.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

M. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
   a. Where conduits enter building from outside.
   b. Where service conduits enter building from underground distribution system.
   c. Where conduits enter building from underground.
   d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
   a. Where conduits pass from outdoors into conditioned interior spaces.

b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

N. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

O. Provide grounding and bonding; see Section 260526.

P. Identify conduits; see Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 260533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

C. Underground boxes/enclosures.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 078400 - Firestopping.

C. Section 260526 - Grounding and Bonding for Electrical Systems.

D. Section 260529 - Hangers and Supports for Electrical Systems.

E. Section 260533.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

F. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 262726 - Wiring Devices:

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. SCTE 77 - Specifications for Underground Enclosure Integrity; 2023.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures and underground boxes/enclosures.
   1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency.

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

D. Project Record Documents: Record actual locations for underground boxes/enclosures.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended.
   4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
   5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
   1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
   2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
   3. Use suitable concrete type boxes where flush-mounted in concrete.
   4. Use suitable masonry type boxes where flush-mounted in masonry walls.
   5. Use raised covers suitable for the type of wall construction and device configuration where required.
   6. Use shallow boxes where required by the type of wall construction.
   7. Do not use "through-wall" boxes designed for access from both sides of wall.
   8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
   9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
   10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
   11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
   12. Wall Plates: Comply with Section 262726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
   1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
   2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:
      a. Outdoor Locations: Type 3R, painted steel.
   3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
      a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
      b. Boxes 6 square feet (0.56 sq m) and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.

D. Underground Boxes/Enclosures:
   1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
   2. Size: As indicated on drawings.
   3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
   4. Provide logo on cover to indicate type of service.
   5. Applications:
      a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
      b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 15 load rating.
      c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
   6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
      a. Manufacturers:
         1) Hubbell Incorporated; Quazite Products; _____: www.hubbellpowersystems.com/#sle.
         2) MacLean Highline; _____: www.macleanhighline.com/#sle.
         3) Oldcastle Precast, Inc; _____: www.oldcastleprecast.com/#sle.
      b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.
      c. Product(s):
         1) MacLean Highline PHA Series: Straight wall, all-polymer concrete splice box/pull box; available Tier 8, Tier 15, and Tier 22 load ratings.
         2) MacLean Highline CHA Series: Fiberglass/polymer concrete splice box/pull box; available Tier 8 and Tier 15 load ratings.
         3) MacLean Highline CVA Series: Fiberglass/polymer concrete splice vault; available Tier 8, Tier 15, and Tier 22 load ratings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

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

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

E. Install boxes plumb and level.

F. Flush-Mounted Boxes:

1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.

G. Install boxes as required to preserve insulation integrity.

H. Underground Boxes/Enclosures:
1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.
2. Flush-mount enclosures located in concrete or paved areas.
3. Mount enclosures located in landscaped areas with top at 1 inch (25 mm) above finished grade.
4. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

I. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

J. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

K. Close unused box openings.

L. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

M. Provide grounding and bonding in accordance with Section 260526.

N. Identify boxes in accordance with Section 260553.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Warning signs and labels.

1.02 RELATED REQUIREMENTS

A. Section 099113 - Exterior Painting.

B. Section 099123 - Interior Painting.

C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
   2. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
      a. Service equipment.
      b. Industrial control panels.
      c. Motor control centers.
      d. Elevator control panels.
      e. Industrial machinery.

B. Identification for Conductors and Cables:
   1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
   2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
   3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
      a. At each source and load connection.
      b. Within boxes when more than one circuit is present.
      c. Within equipment enclosures when conductors and cables enter or leave the enclosure.

4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
5. Use underground warning tape to identify direct buried cables.

C. Identification for Raceways:
1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet (6.1 m).
2. Use voltage markers, color-coded bands, or factory-painted conduits to identify systems other than normal power system for accessible conduits.
   a. Maximum Intervals: 20 feet (6.1 m).
   b. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches (76 mm) wide.
      1) Field-Painting: Comply with Section 099123 and 099113.
      2) Vinyl Color Coding Electrical Tape: Comply with Section 260519.
3. Use identification labels to identify circuits enclosed for accessible conduits at equipment terminations when source is not within sight.
4. Use identification labels to identify spare conduits at each end. Identify purpose and termination location.
5. Use underground warning tape to identify underground raceways.
6. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet (6.1 m).

D. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.
2. Use identification labels to identify circuits enclosed.
3. Use warning labels to identify electrical hazards for boxes containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Manufacturers:
   a. Brimar Industries, Inc: www.brimar.com/#sle.
   b. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.
   c. Seton Identification Products; _____: www.seton.com/#sle.
   d. Substitutions: See Section 016000 - Product Requirements.
2. Materials:
   a. Indoor Clean, Dry Locations: Use plastic nameplates.
   b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:
1. Manufacturers:
   a. Brady Corporation; _____: www.bradyid.com/#sle.
   b. Brother International Corporation: www.brother-usa.com/#sle.
   c. Panduit Corp: www.panduit.com/#sle.
   d. Substitutions: See Section 016000 - Product Requirements.

2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
   a. Use only for indoor locations.
3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

2.03 WIRE AND CABLE MARKERS

A. Manufacturers:
   1. Brady Corporation; _____: www.bradyid.com/#sle.
   2. HellermannTyton; _____: www.hellermanntyton.com/#sle.
   3. Panduit Corp: www.panduit.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

F. Minimum Text Height: 1/8 inch (3 mm).

G. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

A. Manufacturers:
   1. Brady Corporation; _____: www.bradyid.com/#sle.
   2. Brimar Industries, Inc: www.brimar.com/#sle.
   3. Seton Identification Products; _____: www.seton.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

D. Minimum Size:
   1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
   2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).
   3. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).

E. Legend:
   1. Markers for Voltage Identification: Highest voltage present.
   2. Markers for System Identification:

F. Color: Black text on orange background unless otherwise indicated.

2.05 UNDERGROUND WARNING TAPE

A. Manufacturers:
   1. Brady Corporation; _____: www.bradyid.com/#sle.
   2. Brimar Industries, Inc: www.brimar.com/#sle.
   3. Seton Identification Products; _____: www.seton.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

C. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).

D. Legend: Type of service, continuously repeated over full length of tape.

E. Color:
   1. Tape for Buried Power Lines: Black text on red background.

2.06 WARNING SIGNS AND LABELS

A. Manufacturers:
   1. Brimar Industries, Inc: www.brimar.com/#sle.
   2. Clarion Safety Systems, LLC; _____: www.clarionsafety.com/#sle.
   3. Insite Solutions, LLC; _____: www.stop-painting.com/#sle.
   4. Seton Identification Products; _____: www.seton.com/#sle.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

C. Warning Signs:
   1. Materials:
      a. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
   2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
   3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

D. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
   2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
   3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

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

3.02 INSTALLATION

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

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Inside of equipment door.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Interior Components: Legible from the point of access.
   6. Conduits: Legible from the floor.
   7. Boxes: Outside face of cover.
   8. Conductors and Cables: Legible from the point of access.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.

G. Secure rigid signs using stainless steel screws.

END OF SECTION

SECTION 265600
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Ballasts.

C. Poles and accessories.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260533.16 - Boxes for Electrical Systems.

E. Section 262813 - Fuses.

1.03 REFERENCE STANDARDS

A. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals; 2013, with Editorial Revision (2025).

B. ANSI O5.1 - American National Standard for Wood Poles: Specifications and Dimensions; 2022.

C. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.

D. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019 (Reaffirmed 2025).

E. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.

F. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

H. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).

I. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 1598 - Luminaires; Current Edition, Including All Revisions.

L. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
   2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
   2. Provide photometric calculations where luminaires are proposed for substitution upon request.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
      b. Include IES LM-79 test report upon request.
   2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
   3. Lamps: Include rated life and initial and mean lumen output.
   4. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

D. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.

E. Field Quality Control Reports.
   1. Include test report indicating measured illumination levels.

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

G. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

I. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

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

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

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

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

C. Receive, handle, and store wood poles in accordance with ANSI O5.1.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide 2-year manufacturer warranty for all LED luminaires, including drivers.

C. Provide 3-year manufacturer warranty for LED replacement lamps.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 016000 - Product Requirements.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 BALLASTS AND DRIVERS

A. Manufacturers:
   1. California Accent Lighting, Inc; _____; www.calilighting.com/#sle.
   2. General Electric Company/GE Lighting; _____: www.gelighting.com/#sle.
   3. OSRAM Sylvania, Inc; _____: www.osram.us/ds/#sle.
   4. Philips Lighting North America Corporation; _____; www.usa.lighting.philips.com/#sle.
   5. Substitutions: See Section 016000 - Product Requirements.
   6. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.

B. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
   3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

C. Dimmable LED Drivers:
   1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
   2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.04 POLES

A. Manufacturers:

1. Acuity Brands, Inc; _____: www.acuitybrands.com/#sle.
2. Substitutions: See Section 016000 - Product Requirements.

B. All Poles:
1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
2. Structural Design Criteria:
   a. Comply with AASHTO LTS.
   b. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
   c. Include structural calculations demonstrating compliance with submittals.
3. Material: Steel, unless otherwise indicated.
4. Shape: Round straight, unless otherwise indicated.
5. Finish: Match luminaire finish, unless otherwise indicated.
6. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
7. Unless otherwise indicated, provide with the following features/accessories:
   a. Top cap.
   b. Handhole, _____ size.
   c. Anchor base cover.

C. Metal Poles: Provide ground lug, accessible from handhole or transformer base.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install products in accordance with manufacturer's instructions.

D. Install luminaires in accordance with NECA/IESNA 501.

E. Provide required support and attachment in accordance with Section 260529.

F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

G. Pole-Mounted Luminaires:
1. Maintain the following minimum clearances:
   a. Comply with IEEE C2.
   b. Comply with utility company requirements.
2. Foundation-Mounted Poles:

a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 033000.
   1) Install anchor bolts plumb per template furnished by pole manufacturer.
   2) Position conduits to enter pole shaft.
b. Install foundations plumb.
c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
d. Tighten anchor bolt nuts to manufacturer's recommended torque.
e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
f. Install anchor base covers or anchor bolt covers as indicated.

3. Grounding:
   a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
   b. Provide supplementary ground rod electrode as specified in Section 260526 at each pole bonded to grounding system as indicated.
4. Install separate service conductors, size as indicated on drawings, from each luminaire down to handhole for connection to branch circuit conductors.
5. Install non-breakaway in-line fuse holders and fuses complying with Section 262813 in pole handhole or transformer base for each ungrounded conductor.

H. Install accessories furnished with each luminaire.

I. Bond products and metal accessories to branch circuit equipment grounding conductor.

J. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

E. Measure illumination levels at night with calibrated meters to verify compliance with performance requirements.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.06 CLEANING

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

3.07 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

D. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 328423
UNDERGROUND SPRINKLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and fittings, valves, sprinkler heads, emitters, bubblers, and accessories.

B. Control system.

1.02 RELATED REQUIREMENTS

A. Section 312316 - Excavation: Excavating for irrigation piping.

B. Section 312323 - Fill: Backfilling for irrigation piping.

1.03 REFERENCE STANDARDS

A. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems 2020.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with site backfilling, landscape grading and delivery of plant life.

B. Preinstallation Meeting: Convene one week prior to commencing work of this Section.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component and control system and wiring diagrams.

C. Shop Drawings: Indicate piping layout to water source, location of sleeves under pavement, location and coverage of sprinkler heads, components, plant and landscaping features, site structures, schedule of fittings to be used.

D. Operation and Maintenance Data:
   1. Provide instructions for operation and maintenance of system and controls, seasonal activation and shutdown, and manufacturer's parts catalog.
   2. Provide schedule indicating length of time each valve is required to be open to provide a determined amount of water.

E. Record Documents: Record actual locations of all concealed components piping system.

F. Maintenance Materials: Provide the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Wrenches: One for each type head core and for removing and installing each type head.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with applicable code for piping and component requirements.

2.02 IRRIGATION SYSTEM

A. Manually controlled underground irrigation system, with low point self drain.

B. Manufacturers:
   1. Rain Bird Sales, Inc; ____: www.rainbird.com/#sle.
   2. Toro Company; ____: www.toro.com/#sle.
   3. Substitutions: See Section 016000 - Product Requirements.

2.03 PIPE MATERIALS

A. Fittings: Type and style of connection to match pipe.

B. Pipe Risers at Valves: 160 psi (1.10 MPa) PVC pipe.

C. Solvent Cement: ASTM D2564 for PVC pipe and fittings.

D. Sleeve Material: PVC.

2.04 OUTLETS

A. Rotary Type Sprinkler Head: Fixed type with screens; fully adjustable for flow and pressure; size as indicated; with letter or symbol designating degree of arc and arrow indicating center of spray pattern.

B. Spray Type Sprinkler Head: Fixed surface head.

2.05 VALVES

A. Gate Valves: Bronze construction non-rising stem.

B. Backflow Preventers: Iron body construction, double check valve type.

2.06 CONTROLS

A. Controller: Automatic controller, microprocessor solid state control with visible readout display, temporary override feature to bypass cycle for inclement weather, timer for a 4 station system, programmable for 7 days in quarter hour increments, with automatic start and shutdown.

B. Controller Housing: NEMA 250 Type 3; weatherproof, watertight, with lockable access door.

C. Valves: Hydraulic; normally open; hydraulic tubing, including required fittings and accessories.

D. Wire Conductors: Color coded.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify location of existing utilities.

B. Verify that required utilities are available, in proper location, and ready for use.

3.02 PREPARATION

A. Piping layout indicated is diagrammatic only. Route piping to avoid plants, ground cover, and structures.

B. Layout and stake locations of system components.

C. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system.

3.03 TRENCHING

A. Trench and backfill in accordance with Section 312316 and Section 312323.

B. Trench to accommodate grade changes and slope to drains.

C. Maintain trenches free of debris, material, or obstructions that may damage pipe.

3.04 INSTALLATION

A. Install pipe, valves, controls, and outlets in accordance with manufacturer's instructions.

B. Connect to utilities.

C. Set outlets and box covers at finish grade elevations.

D. Provide for thermal movement of components in system.

E. Use threaded nipples for risers to each outlet.

F. After piping is installed, but before outlets are installed and backfilling commences, open valves and flush system with full head of water.

3.05 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 014000 - Quality Requirements.

B. Prior to backfilling, test system for leakage at main piping to maintain 100 psi (690 kPa) pressure for one hour.

C. System is acceptable if no leakage or loss of pressure occurs and system self drains during test period.

3.06 BACKFILLING

A. Provide 3 inch (75 mm) sand cover over piping.

B. Backfill trench and compact to specified subgrade elevation. Protect piping from displacement.

3.07 SYSTEM STARTUP

A. Prepare and start system in accordance with manufacturer's instructions.

B. Adjust control system to achieve time cycles required.

C. Adjust head types for full water coverage as directed.

3.08 CLOSEOUT ACTIVITIES

A. Instruct Owner's personnel in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance data as basis for demonstration.

3.09 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide one complete spring start-up and a fall shutdown by installer, at no extra cost to Owner.

END OF SECTION

SECTION 329219
SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Seeding, mulching and fertilizer.

1.02 RELATED REQUIREMENTS

A. Section 312200 - Grading: Preparation of subsoil topsoil in preparation for the work of this section.

1.03 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 DELIVERY, STORAGE, AND HANDLING

PART 2 PRODUCTS

2.01 SEED MIXTURE

A. Seed Mixture:
   1. Kentucky Blue Grass: ____ percent.
   2. Creeping Red Fescue Grass: ____ percent.
   3. Red Top: ____ percent.
   4. Norlea Perennial Rye: ____ percent.

2.02 SOIL MATERIALS

A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.

2.03 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fertilizer: Recommended for grass, with 50 percent of the elements derived from organic sources; of proportion necessary to eliminate deficiencies of topsoil, to the following proportions:

C. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

D. Erosion Fabric: Jute matting, open weave.

E. Stakes: Softwood lumber, chisel pointed.

F. String: Inorganic fiber.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

A. Prepare subgrade in accordance with Section 312200.

B. Place topsoil in accordance with Section 329119.

3.03 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches (50 mm) of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.04 SEEDING

A. Apply seed at a rate of ____ lbs per 1000 sq ft (____ Kg per 1000 sq m) evenly in two intersecting directions. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Do not sow immediately following rain, when ground is too dry, or during windy periods.

D. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches (3 mm). Maintain clear of shrubs and trees.

E. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches (100 mm) of soil.

F. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches (100 by 100 mm).

3.05 PROTECTION

A. Cover seeded slopes where grade is 4 inches per foot (____ mm per m) or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

B. Lay fabric smoothly on surface, bury top end of each section in 6 inch (150 mm) deep excavated topsoil trench. Provide 12 inch (300 mm) overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.

C. Secure outside edges and overlaps at 36 inch (900 mm) intervals with stakes.

D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches (150 mm).

END OF SECTION

SECTION 329300
PLANTS

PART 2 PRODUCTS

1.01 PLANTS

A. Plants: Species and size identified in plant schedule, grown in climatic conditions similar to those in locality of the work.

END OF SECTION