ADDENDUM NO.1

Sandy Pond Road Sanitary Sewer Rehabilitation
Ayer DPW

This addendum amends and/or supplements the bid documents as indicated below. Only these items alter the Bid Documents; any verbal discussions or responses are hereby declared null and void.

Bids for the construction of the Project will be received by Dan Van Schalkwyk, Department of Public Works Director, at 25 Brook Street, Ayer, Massachusetts 01432 until 1:00 PM Local Time Wednesday, July 12, 2023, at which time they will be publicly opened and read aloud. Bids may be mailed or hand -delivered. Hand delivered bids shall be placed in the Ayer DPW Drop Box located at the DPW Administrative building at 25 Brook Street prior to the date and time listed above.

Bidder shall acknowledge receipt of this addendum on the Form for General Bid.

SPECIFICATIONS

1. **Replace "Sandy Pond Road Sanitary Sewer Rehabilitation Project Manual" in its entirety with the attached "Sandy Pond Road Sanitary Sewer Rehabilitation Project Manual".** The project manual was updated to include Divisions 01, 32 and 33.

ARCADIS

Town of Ayer

Department of Public Works, 25 Brook Street, Ayer, MA 01432

Set No. _____

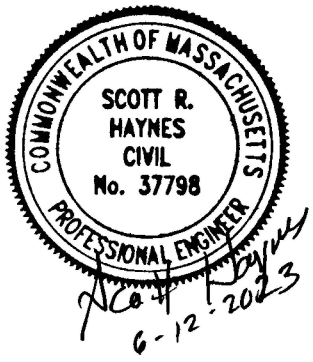
Project Manual

Volume 1 of 1

Town of Ayer, MA

Sandy Pond Road Sanitary Sewer Rehabilitation

June 2023



Prepared By:

Arcadis U.S., Inc.

500 Edgewater Drive, Suite 511
Wakefield, MA 01880
+1 781 224 4488

30157998

AYER, MA
DEPARTMENT OF PUBLIC WORKS

SANDY POND ROAD SANITARY SEWER REHABILITATION

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ADVERTISEMENT

Town of Ayer, Massachusetts
Sandy Pond Road Sanitary Sewer Rehabilitation

General Notice

The Town of Ayer (Owner) is requesting Bids for the construction of the following Project:

Sandy Pond Road Sanitary Sewer Rehabilitation

Bids for the construction of the Project will be received by Dan Van Schalkwyk, Department of Public Works Director, at **25 Brook Street, Ayer, Massachusetts 01432 until 1:00 PM Local Time Wednesday, July 12, 2023**, at which time they will be publicly opened and read aloud. Bids may be mailed or hand - delivered. Hand delivered bids shall be placed in the Ayer DPW Drop Box located at the DPW Administrative building at 25 Brook Street prior to the date and time listed above.

The Project includes the following Work:

> **Providing all materials, equipment, labor, and supervision, for pipeline cleaning, (pre)- and post rehabilitation closed circuit television (CCTV) inspection, sewer pipe rehabilitation by cured-in-place pipe lining and associated work, sewer lateral rehabilitation by cured-in-place lateral lining and associated work, manhole rehabilitation, complete with all other appurtenances and related work required to complete the project.**

Bids are requested for the following Contract: **Sandy Pond Road Sanitary Sewer Rehabilitation**

Selection of the contractor will be based upon bidder qualifications, including evidence of past performance in similar construction rehabilitation projects, and the bid price.

The award of this contract may be subject to the availability of Town funds.

Bid Security

Bid security shall be furnished in accordance with the Instructions to Bidders.

Obtaining the Bidding Documents

Beginning Wednesday, June 14th, 2023, Information and Bidding Documents for the Project can be acquired for free of charge from the following designated website:

www.ayer.ma.us/bids

Prospective Bidders are urged to register with the designated website as a plan holder, even if Bidding Documents are obtained from a plan room or source other than the designated website in either electronic or paper format. The designated website will be updated periodically with addenda, lists of registered plan holders, reports, and other information relevant to submitting a Bid for the Project. All official notifications, addenda, and other Bidding Documents will be offered only through the designated website. Neither Owner nor Engineer will be responsible for Bidding Documents, including addenda, if any, obtained from sources other than the designated website.

Pre-bid Conference

A pre-bid conference for the Project will not be held.

Statutory Requirements

The bidding and award of the Contract shall be in full compliance with Section 39M inclusive of Chapter 30 of the Commonwealth of Massachusetts as last revised.

Instructions to Bidders.

For all further requirements regarding bid submittal, qualifications, procedures, and contract award, refer to the Instructions to Bidders that are included in the Bidding Documents.

This Advertisement is issued by:

Owner: Town of Ayer
By: Dan Van Schalkwyk
Title: Director of Public Works

INSTRUCTIONS TO BIDDERS

Town of Ayer, Massachusetts
Department of Public Works
Sandy Pond Road Sanitary Sewer Rehabilitation

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ARTICLE 1—DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. *Issuing Office*—The office from which the Bidding Documents are to be issued, and which registers plan holders.

ARTICLE 2—BIDDING DOCUMENTS

2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Agreement for a list of the Contract Documents. It is Bidder's responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.

2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.

2.03 Owner has established a Bidding Documents Website as indicated in the Advertisement or invitation to bid. Owner recommends that Bidder register as a plan holder with the Issuing Office at such website and obtain a complete set of the Bidding Documents from such website. Bidders may rely that sets of Bidding Documents obtained from the Bidding Documents Website are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.

2.04 *Electronic Documents*

A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.

1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader Version 6.0 or later. It is the intent of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.

B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.04.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents

and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.

ARTICLE 3—QUALIFICATIONS OF BIDDERS

3.01 Bidder is to submit the following information with its Bid to demonstrate Bidder's qualifications to perform the Work: (Complete the Qualifications Statement included in the Bidding Documents.)

A. Written evidence establishing its qualifications such as financial data, previous experience, and present commitments.

B. A written statement that Bidder is authorized to do business in the state where the Project is located, or a written certification that Bidder will obtain such authority prior to the Effective Date of the Contract.

C. Bidder's state or other contractor license number, if applicable.

D. Subcontractor and Supplier qualification information.

E. Other required information regarding qualifications.

3.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.

3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

ARTICLE 4—PRE-BID CONFERENCE

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

ARTICLE 5—SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

5.01 *Site and Other Areas*

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

5.02 *Existing Site Conditions*

A. *Subsurface and Physical Conditions; Hazardous Environmental Conditions*

1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:

a. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.

b. Those drawings known to Owner of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data.

c. Reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.

d. Technical Data contained in such reports and drawings.

2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

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

5.03 *Other Site-related Documents*

A. In addition to the documents regarding existing Site conditions referred to in Paragraph 5.02.A, the following other documents relating to conditions at or adjacent to the Site are known to Owner and made available to Bidders at the Issuing Office for reference:

1. **Sanitary Sewer Record Drawings**

2. **Sanitary Sewer Tie-Cards**

3. **Closed-Circuit Inspection Reports and Videos**

4. **Manhole Inspection Reports**

Owner will make these other Site-related documents available to any Bidder to examine at the Issuing Office on request.

B. Owner has not verified the contents of these other Site-related documents, and Bidder may not rely on the accuracy of any data or information in such documents. Bidder is responsible for any interpretation or conclusion Bidder draws from the other Site-related documents.

C. The other Site-related documents are not part of the Contract Documents.

D. Bidders are encouraged to review the other Site-related documents, but Bidders will not be held accountable for any data or information in such documents. The requirement to review and take responsibility for documentary Site information is limited to information in (1) the Contract Documents and (2) the Technical Data.

5.04 *Site Visit and Testing by Bidders*

A. Bidder is required to visit the Site and conduct a thorough visual examination of the Site and adjacent areas. During the visit the Bidder must not disturb any ongoing operations at the Site.

B. Bidders visiting the Site are required to arrange their own transportation to the Site.

C. If Bidder would prefer a guided Site visit, then it must be coordinated through the Owner. Bidder must conduct the required Site visit during normal working hours.

D. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.

E. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder general access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site. Bidder is responsible for establishing access needed to reach specific selected test sites.

F. Bidder must comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.

G. Bidder must fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

5.05 *Owner's Safety Program*

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

5.06 *Other Work at the Site*

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

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Express Representations and Certifications in Bid Form, Agreement*

A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder's examination of Project documentation, Site visit, and preparation of the Bid, and certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should review these representations and certifications and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.

B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.

ARTICLE 7—INTERPRETATIONS AND ADDENDA

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

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

Department of Public Works
Attention: Dan Van Schalkwyk, P.E., Director of Public Works
25 Brook Street
Ayer, Massachusetts, 01432
SUBJECT: Sandy Pond Road Sanitary Sewer Rehabilitation – Bidding Documents Question

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

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

ARTICLE 8—BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 10 percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a Bid bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions. Such Bid bond will be issued in the form included in the Bidding Documents.

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

8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the

Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

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

ARTICLE 9—CONTRACT TIMES

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

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

ARTICLE 10—SUBSTITUTE AND "OR EQUAL" ITEMS

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

10.02 All prices that Bidder sets forth in its Bid will be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda, if any. Any assumptions regarding the possibility of post-Bid approvals of "or-equal" or substitution requests are made at Bidder's sole risk.

ARTICLE 11—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

11.01 A Bidder must be prepared to retain specific Subcontractors and Suppliers for the performance of the Work if required to do so by the Bidding Documents or in the Specifications. If a prospective Bidder objects to retaining any such Subcontractor or Supplier and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

11.02 The apparent Successful Bidder, and any other Bidder so requested, must submit to Owner a list of the Subcontractors or Suppliers proposed for any portions of the Work within five days after Bid opening.

11.03 If requested by Owner, such list must be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor or Supplier. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, without an increase in Bid price.

11.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors and Suppliers. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid

security of any Bidder. Any Subcontractor or Supplier, so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.07 of the General Conditions.

ARTICLE 12—PREPARATION OF BID

12.01 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.

B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."

12.02 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.

12.03 A Bid by a corporation must be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate seal must be affixed and attested by the corporate secretary or an assistant corporate secretary. The corporate address and state of incorporation must be shown.

12.04 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership must be shown.

12.05 A Bid by a limited liability company must be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown.

12.06 A Bid by an individual must show the Bidder's name and official address.

12.07 A Bid by a joint venture must be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture must be shown.

12.08 All names must be printed in ink below the signatures.

12.09 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.

12.10 Postal and e-mail addresses and telephone number for communications regarding the Bid must be shown.

12.11 The Bid must contain evidence of Bidder's authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.

12.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder's licensure, or Bidder must certify in writing that it will obtain such licensure within the time for acceptance of Bids and attach such certification to the Bid. Bidder's state contractor license number, if any, must also be shown on the Bid Form.

ARTICLE 13—BASIS OF BID

13.01 *Lump Sum and Unit Price*

A. Bidders must submit a Bid on a lump sum and/or unit price basis for each item of Work listed in the unit price section of the Bid Form.

B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity", which Owner or its representative has set forth in the Bid Form, for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

ARTICLE 14—SUBMITTAL OF BID

14.01 The Bidding Documents include the Bid Form, and, if required, the Bid Bond Form. The Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 2 of the Bid Form.

14.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must be enclosed in an opaque, plainly marked package with the Project title, and, if applicable, the designated portion of the Project for which the Bid is submitted, the project contract number, the name and address of Bidder and its license or registration number, if applicable, and must be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid must be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid must be addressed to the location designated in the Advertisement.

14.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

ARTICLE 15—MODIFICATION AND WITHDRAWAL OF BID

15.01 An unopened Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.

15.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 15.01 and submit a new Bid prior to the date and time for the opening of Bids.

15.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, the Bidder may withdraw its Bid, and the Bid security will be returned.

ARTICLE 16—OPENING OF BIDS

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

ARTICLE 17—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

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

ARTICLE 18—EVALUATION OF BIDS AND AWARD OF CONTRACT

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

18.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.

18.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, whether in the Bid itself or in a separate communication to Owner or Engineer, then Owner will reject the Bid as nonresponsive.

18.04 If Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest responsive Bid.

18.05 *Evaluation of Bids*

A. In evaluating Bids, Owner will consider whether the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

B. To determine the Bid prices for purposes of comparison, alternates will be accepted following the order of priority established by the Owner, until doing so would cause the budget to be exceeded. After determination of the Successful Bidder based on this comparative process and on the responsiveness, responsibility, and other factors set forth in these Instructions, the award may be made to said Successful Bidder on its base Bid and any combination of its additive alternate Bid items for which Owner determines funds will be available at the time of award.

18.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.

18.07 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 19—BONDS AND INSURANCE

19.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds, other required bonds (if any), and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by required bonds and insurance documentation.

19.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

ARTICLE 20—SIGNING OF AGREEMENT

20.01 When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder must execute and deliver the required number of counterparts of the Agreement and any bonds and insurance documentation required to be delivered by the Contract Documents to Owner. Within 10 days thereafter, Owner will deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 21—NOT USED

ARTICLE 22—SALES AND USE TAXES

22.01 Owner is exempt from Massachusetts state sales and use taxes on materials and equipment to be incorporated in the Work. Said taxes must not be included in the Bid. Refer to Paragraph SC-7.10 of the Supplementary Conditions for additional information.

ARTICLE 23—NOT USED

TOWN OF AYER, MA

DEPARTMENT OF PUBLIC WORKS

SANDY POND ROAD SANITARY SEWER REHABILITATION

BID FORM

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

ARTICLE 1—OWNER AND BIDDER

1.01 This Bid is submitted to:

Town of Ayer, Massachusetts

Department of Public Works

25 Brook Street

Ayer, Massachusetts 01432

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

2.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security;

B. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids;

C. Contractor's license number as evidence of Bidder's State Contractor's License or a covenant by Bidder to obtain said license within the time for acceptance of Bids;

D. Affidavit of Non-Collusion; and

E. Required Bidder Qualification Statement with supporting data.

ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

3.01 *Lump Sum and Unit Price Bids*

A. Bidder will complete the Work in accordance with the Contract Documents for the lump sum (stipulated) price(s), together with any Unit Prices indicated in the attached Unit Price Bid Form.

B. Bidder acknowledged that:

1. Each Bit Unit Price and Lump Sum Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item; and

2. Estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

ARTICLE 4—NOT USED

ARTICLE 5—NOT USED

ARTICLE 6—TIME OF COMPLETION

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

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

7.01 *Bid Acceptance Period*

A. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

7.02 *Instructions to Bidders*

A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

7.03 *Receipt of Addenda*

A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

ARTICLE 8—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

8.01 *Bidder's Representations*

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.
5. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
6. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
7. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
8. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
9. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

BIDDER hereby submits this Bid as set forth above:

Bidder:

_____

(typed or printed name of organization)

By: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

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

Attest: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

Address for giving notices:

_____

_____

Bidder's Contact:

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Phone: _____

Email: _____

Address:

_____

_____

_____

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

Town of Ayer, Massachusetts
Sandy Pond Road Sanitary Sewer Rehabilitation
Unit Price Bid Form

Item No.	Brief Description and Unit or Lump Sum Price Bid in Words	Estimated Quantity	Units	Unit Price Bid in Numbers	Total Item Bid Price
1. SANITARY SEWER CLEANING AND CCTV INSPECTION					
1a.	Sanitary Sewer Cleaning and CCTV Inspection of 15-inch Sewer Pipe _____ Dollars	550	LF		
1b.	Sanitary Sewer Cleaning and CCTV Inspection of 21-inch Sewer Pipe _____ Dollars	4,550	LF		
1c.	Sanitary Sewer Cleaning and CCTV Inspection of 24-inch Sewer Pipe _____ Dollars	3,100	LF		
2. GRINDING OF PROTRUDING SERVICE CONNECTIONS					
2a.	Grinding of Protruding Service Connections _____ Dollars	31	EA		
3. REINSTATEMENT OF SERVICE CONNECTION BY REMOTE (TRENCHLESS) METHOD					
3a.	Reinstatement of Service Connections in Sewer Pipe _____ Dollars	60	EA		
4. CURED-IN-PLACE LATERAL CONNECTION LINERS					
4a.	Cured-in-Place Lateral Connection Liners _____ Dollars	60	EA		
5. CURED-IN-PLACE PIPE LINING (CIPPL) WARRANTY INSPECTION					
5a.	CIPPL Warranty Inspection **THREE** _____ Dollars	8,200	LS	**$ 3.00**	**$ 24,600.00**
6. CHEMICAL SEALING OF SERVICE CONNECTIONS					
6a.	Chemical Sealing of Service Connections _____ Dollars	5	EA		
7.SEALED SERVICE CONNECTION WARRANTY INSPECTION					
7a.	Sealed Service Connection Warranty Inspection and Testing **THREE THOUSAND** _____ Dollars	1	LS	**$ 3,000.00**	**$ 3,000.00**

Town of Ayer, Massachusetts
Sandy Pond Road Sanitary Sewer Rehabilitation
Unit Price Bid Form

Item No.	Brief Description and Unit or Lump Sum Price Bid in Words	Estimated Quantity	Units	Unit Price Bid in Numbers	Total Item Bid Price
ALTERNATIVE NO. 1 - STEAM OR HOT WATER CURED-IN-PLACE PIPING LINING					
8.1 STEAM OR HOT WATER CURED-IN-PLACE PIPE LINING					
8.1a.	Steam/Hot Water Cured-in-place Pipe Lining of 15-inch Sewer Pipe _____ Dollars	550	LF		
8.1b.	Steam/Hot Water Cured-in-place Pipe Lining of 21-inch Sewer Pipe _____ Dollars	4,550	LF		
8.1c.	Steam/Hot Water Cured-in-place Pipe Lining of 24-inch Sewer Pipe _____ Dollars	3,100	LF		
	SUBTOTAL ITEMS 1 THROUGH 7 INCLUSIVE AND 8.1				
9.1. MOBILIZATION AND DEMOBILIZATION					
9.1a.	Mobilization and Demobilization (maximum 5% of subtotal of items 1 through 7 and Item 8.1) _____ Dollars	1	LS		
	TOTAL ALTERNATIVE NO.1 BASE BID PRICE IN WORDS _____ Dollars				

ALTERNATIVE NO. 2 - UV CURED-IN-PLACE PIPING LINING					
8.2 UV CURED-IN-PLACE PIPE LINING					
8.2a.	UV Cured-in-place Pipe Lining of 15-inch Sewer Pipe _____ Dollars	550	LF		
8.2b.	UV Cured-in-place Pipe Lining of 21-inch Sewer Pipe _____ Dollars	4,550	LF		
8.2c.	UV Cured-in-place Pipe Lining of 24-inch Sewer Pipe _____ Dollars	3,100	LF		
	SUBTOTAL ITEMS 1 THROUGH 7 INCLUSIVE AND 8.2				
9.2. MOBILIZATION AND DEMOBILIZATION					
9.2a.	Mobilization and Demobilization (maximum 5% of subtotal of items 1 through 7 and Item 8.2) _____ Dollars	1	LS		
	TOTAL ALTERNATIVE NO.2 BASE BID PRICE IN WORDS _____ Dollars				

Town of Ayer, Massachusetts
Sandy Pond Road Sanitary Sewer Rehabilitation
Unit Price Bid Form

Item No.	Brief Description and Unit or Lump Sum Price Bid in Words	Estimated Quantity	Units	Unit Price Bid in Numbers	Total Item Bid Price
ADDITIVE ALTERNATE BID ITEMS					
10. MANHOLE FRAME AND COVER REPLACEMENT					
10a.	Manhole Frame and Cover Replacement _____ Dollars	8	EA		
11. MANHOLE CEMENTITIOUS LINING					
11a.	Manhole Rehabilitation - Fiber Reinforced Cementitious Lining _____ Dollars	550	VF		
12. MANHOLE EPOXY LINING					
12a.	Manhole Rehabilitation - Monolithic Epoxy Lining _____ Dollars	600	VF		
13. MANHOLE REHABILITATION WARRANTY INSPECTION					
13a.	Manhole Rehabilitation Warranty Inspection **TWO HUNDRED** _____ Dollars	35	EA	**$ 200.00**	**$ 7,000.00**
	SUBTOTAL ITEMS 10 THROUGH 13				
14. MOBILIZATION AND DEMOBILIZATION					
14a.	Mobilization and Demobilization (maximum 5% of subtotal of items 10 through 13) _____ Dollars	1	LS		
	SUBTOTAL BID FOR ADDITIVE ALTERNATE BID PRICE IN WORDS **_____ Dollars**				

TOTALS		
	TOTAL ALTERNATIVE NO. 1 BASE BID (STEAM OR HOT WATER CIPPL) AND ADDITIVE ALTERNATE BID PRICE IN WORDS **_____ Dollars**	
	TOTAL ALTERNATIVE NO. 2 BASE BID (UV CIPPL) AND ADDITIVE ALTERNATE BID PRICE IN WORDS **_____ Dollars**	

BID BOND

Any singular reference to Bidder, Surety, Owner, or other party shall be considered plural where applicable.

BIDDER *(Name and Address)*:

SURETY *(Name, and Address of Principal Place of Business)*:

OWNER *(Name and Address)*:
Town of Ayer – Department of Public Works
25 Brook Street
Ayer, MA 01432

BID
Bid Due Date:
Description *(Project Name— Include Location)*: Sandy Pond Road Sanitary Sewer Rehabilitation

BOND
Bond Number:
Date:
Penal sum _____ $ _____
(Words) (Figures)

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

BIDDER	**SURETY**
_____ (Seal)	_____ (Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature	Signature (Attach Power of Attorney)
_____	_____
Print Name	Print Name
_____	_____
Title	Title
Attest: _____	Attest: _____
Signature	Signature
_____	_____
Title	Title

Note: Addresses are to be used for giving any required notice.
Provide execution by any additional parties, such as joint venturers, if necessary.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder any difference between the total amount of Bidder's Bid and the total amount of the Bid of the next lowest, responsible Bidder that submitted a responsive Bid as determined by Owner for the work required by the Contract Documents, provided that:

    1.1 If there is no such next Bidder, and Owner does not abandon the Project, then Bidder and Surety shall pay to Owner the penal sum set forth on the face of this Bond, and
    1.2 In no event shall Bidder's and Surety's obligation hereunder exceed the penal sum set forth on the face of this Bond.
    1.3 Recovery under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

    3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

    3.2 All Bids are rejected by Owner, or

    3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

QUALIFICATIONS STATEMENT

Prepared by

Issued and Published Jointly by

QUALIFICATIONS STATEMENT

THE INFORMATION SUPPLIED IN THIS DOCUMENT IS CONFIDENTIAL TO THE EXTENT PERMITTED BY LAWS AND REGULATIONS

1. SUBMITTED BY:

Official Name of Firm: _____

Address: _____

_____

_____

2. SUBMITTED TO: _____

3. SUBMITTED FOR: _____

Owner: _____

Project Name: _____

_____

_____

_____

TYPE OF WORK: _____

_____

_____

4. CONTRACTOR'S CONTACT INFORMATION

Contact Person: _____

Title: _____

Phone: _____

Email: _____

5. AFFILIATED COMPANIES:

Name: _____

Address: _____

_____

_____

6. TYPE OF ORGANIZATION:

☐ SOLE PROPRIETORSHIP

Name of Owner: _____

Doing Business As: _____

Date of Organization: _____

☐ PARTNERSHIP

Date of Organization: _____

Type of Partnership: _____

Name of General Partner(s): _____

_____

_____

☐ CORPORATION

State of Organization: _____

Date of Organization: _____

Executive Officers:

- President: _____

- Vice President(s): _____

_____

_____

- Treasurer: _____

- Secretary: _____

☐ LIMITED LIABILITY COMPANY

State of Organization: _____

Date of Organization: _____

Members: _____

_____

_____

_____

☐ JOINT VENTURE

Sate of Organization: _____

Date of Organization: _____

Form of Organization: _____

Joint Venture Managing Partner

- Name: _____

- Address: _____

_____

_____

Joint Venture Managing Partner

- Name: _____

- Address: _____

_____

Joint Venture Managing Partner

- Name: _____

- Address: _____

_____

7. LICENSING

Jurisdiction: _____

Type of License: _____

License Number: _____

Jurisdiction: _____

Type of License: _____

License Number: _____

8. CERTIFICATIONS

CERTIFIED BY:

Disadvantage Business Enterprise: _____

Minority Business Enterprise: _____

Woman Owned Enterprise: _____

Small Business Enterprise: _____

Other (_____): _____

9. BONDING INFORMATION

Bonding Company: _____

Address: _____

_____

Bonding Agent: _____

Address: _____

_____

_____

Contact Name: _____

Phone: _____

Aggregate Bonding Capacity: _____

Available Bonding Capacity as of date of this submittal: _____

10. FINANCIAL INFORMATION

Financial Institution: _____

Address: _____

_____

Account Manager: _____

Phone: _____

INCLUDE AS AN ATTACHMENT AN AUDITED BALANCE SHEET FOR EACH OF THE LAST 3 YEARS

11. CONSTRUCTION EXPERIENCE:

Current Experience:

List on **Schedule A** all uncompleted projects currently under contract (If Joint Venture list each participant's projects separately).

Previous Experience:

List on **Schedule B** all projects completed within the last 5 Years (If Joint Venture list each participant's projects separately).

Has firm listed in Section 1 ever failed to complete a construction contract awarded to it?

☐ YES ☐ NO

If YES, attach as an Attachment details including project owner's contact information.

Has any corporate officer, partner, joint venture participant, or proprietor ever failed to complete a construction contract awarded to them in their name or when acting as a principal of another entity?

☐ YES ☐ NO

If YES, attach as an Attachment details including Project Owner's contact information.

Are there any judgments, claims, disputes or litigation pending or outstanding involving the firm listed in Section 1 or any of its officers (or any of its partners if a partnership or any of the individual entities if a joint venture)?

☐ YES ☐ NO

If YES, attach as an Attachment details including Project Owner's contact information.

12. SAFETY PROGRAM:

Name of Contractor's Safety Officer:_____

Include the following as attachments:

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) OSHA Form 300A - Summary of Occupational Injuries and Illnesses for each of the past 5 years. When requested by Owner or Engineer after receipt of Bids, promptly submit OSHA Form 300 – Log of Work-Related Injuries and Illnesses, for each of the past 5 years.

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) list of all OSHA Citations & Notifications of Penalty (monetary or other) received within the last 5 years (indicate disposition as applicable) - IF NONE SO STATE.

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) list of all safety citations or violations under any state all received within the last five years (indicate disposition as applicable) - IF NONE SO STATE.

Provide the following for the firm listed in Section V (and for each proposed Subcontractor furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) the following (attach additional sheets as necessary):

Workers' compensation Experience Modification Rate (EMR) for the last 5 years:

YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____

Total Recordable Frequency Rate (TRFR) for the last 5 years:

YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____

Total number of man-hours worked for the last 5 Years:

YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____

Provide Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) Days Away From Work, Days of Restricted Work Activity or Job Transfer (DART) incidence rate for the particular industry or type of Work to be performed by Contractor and each of Contractor's proposed Subcontractors and Suppliers) for the last 5 years:

YEAR	_____	DART	_____
YEAR	_____	DART	_____
YEAR	_____	DART	_____
YEAR	_____	DART	_____
YEAR	_____	DART	_____

13. EQUIPMENT:

MAJOR EQUIPMENT:

List on **Schedule C** all pieces of major equipment available for use on Owner's Project.

I HEREBY CERTIFY THAT THE INFORMATION SUBMITTED HEREWITH, INCLUDING ANY ATTACHMENTS, IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____

NOTARY ATTEST:

SUBSCRIBED AND SWORN TO BEFORE ME

THIS _____ DAY OF _____, 20___

NOTARY PUBLIC - STATE OF _____

MY COMMISSION EXPIRES:_____

REQUIRED ATTACHMENTS

1. Schedule A (Current Experience).
2. Schedule B (Previous Experience).
3. Schedule C (Major Equipment).
4. Audited balance sheet for each of the last 3 years for firm named in Section 1.
5. Evidence of authority for individuals listed in Section 7 to bind organization to an agreement.
6. Resumes of officers and key individuals (including Safety Officer) of firm named in Section 1.
7. Required safety program submittals listed in Section 13.
8. Additional items as pertinent.

SCHEDULE A

CURRENT EXPERIENCE

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

SCHEDULE B

PREVIOUS EXPERIENCE (Include ALL Projects Completed within last 5 years)

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

SCHEDULE B

PREVIOUS EXPERIENCE (Include ALL Projects Completed within last 5 years)

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

SCHEDULE C - LIST OF MAJOR EQUIPMENT AVAILABLE

ITEM	PURCHASE DATE	CONDITION	ACQUIRED VALUE

+ + END OF QUALIFICATIONS STATEMENT + +

00 43 13.1

STATEMENT OF NON-COLLUSION

By submission of this bid each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bidder each party certifies as to its own organization under penalty of perjury, that to the best of knowledge and belief:

A.) The prices in this bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor.

B.) Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to the bid opening, directly or indirectly, to any other bidder or to any competitor.

C.) No attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not submit a bid for the purpose of restricting competition.

I hereby sign this document acting within my authority as a duly authorized representative of the named bidder. By signing below I certify, affirm and acknowledge that the information set forth in this document is true, accurate and complete to the best of my information and knowledge.

Signature of Bidder: _____ Dated: _____

Note: The Bidders signature must be notarized to be considered a responsive Bid!

_____

Notary Public

_____

Date

Name and Addresses of Members of the Firm:

_____

_____

_____

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

This Agreement is by and between the Town of Ayer acting through its Department of Public Works ("Owner") and _____("Contractor").

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

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

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

provide all labor, services, tools, materials, equipment, and incidentals necessary to complete all the Work as specified or indicated in the Contract Documents to construct the Sandy Pond Road Sanitary Sewer Rehabilitation. The Work is generally described in Specifications Section 01 11 13, Summary of Work.

ARTICLE 2—THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: **[Brief description of Project]**

Providing all materials, equipment, labor, incidentals, and supervision for trenchless rehabilitation of 15-inch, 21-inch, and 24-inch diameter sanitary sewer pipe including pipeline cleaning and pre- and post-rehabilitation closed-circuit television (CCTV) inspection, cured-in-place pipe lining (CIPPL) by either Alternative bid item no.1-Ultraviolet (UV) CIPPL, or Alternative Bid Item No. 2 – Steam CIPPL, post rehabilitation reinstatement of service connections, cured-in-place lateral connection lining (LCL), Additive Alternate bid item No. 1 – Manhole Rehabilitation; including manhole frame and cover replacement, cementitious lining, and epoxy lining and all appurtenances and related work to complete all bid items included in the contract.

ARTICLE 3—ENGINEER

3.01 The Owner has retained Arcadis U.S., Inc., 500 Edgewater Drive, Suite 511, Wakefield, MA 01880, ("Engineer") to act as Owner's representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.

ARTICLE 4—CONTRACT TIMES

4.01 *Time is of the Essence*

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

4.03 *Contract Times: Days*

A. The Work will be substantially complete within 160 days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions

4.04 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. *Substantial Completion:* Contractor shall pay Owner $1,000.00 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.

B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

4.06 *Special Damages*

A. Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.

B. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.

C. The special damages imposed in this paragraph are supplemental to any liquidated damages for delayed completion established in this Agreement.

ARTICLE 5—CONTRACT PRICE

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

A. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

1. For all Unit Price Work, an amount equal to the sum of the extended prices (established for each separately identified item of Unit Price Work by multiplying the unit price times the actual quantity of that item). The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in Paragraph 13.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer.

ARTICLE 6—PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on the basis of Contractor's Applications for Payment on or about the 25th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.

a. 95% percent of the value of the Work completed (with the balance being retainage).

B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 100 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 150 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

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

6.04 *Consent of Surety*

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

6.05 *Interest*

A. All amounts not paid when due will bear interest at the maximum rate allowed by law at the place of the Project.

ARTICLE 7—CONTRACT DOCUMENTS

7.01 *Contents*

A. The Contract Documents consist of all of the following:

1. This Agreement.
2. Bonds:
    a. Performance bond (together with power of attorney), Section 00 61 13.
    b. Payment bond (together with power of attorney), Section 00 61 16.
3. General Conditions, Section 00 73 01.
4. Supplementary Conditions, Section 00 73 01.
5. Specifications as listed in the table of contents of the project manual. Section 00 01 10.
6. The Drawings comprising a set titled "Sandy Pond Road Sanitary Sewer Rehabilitation", dated June 2023.
8. Addenda (numbers _____ to _____, inclusive).
9. Exhibits to this Agreement (enumerated as follows):

    a. 00 73 46, Wage Determination Schedule

The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:

a. Notice to Proceed.
b. Work Change Directive(s).
c. Change Orders.

B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 7.

D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 *Contractor's Representations*

A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:

1. Contractor has examined and carefully studied the Contract Documents, including Addenda, if any.

2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.

4. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.

5. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

6. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

7. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

8. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

9. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

8.02 *Contractor's Certifications*

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:

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

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 *Standard General Conditions*

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

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

This Agreement will be effective on **_____, 2023** (which is the Effective Date of the Contract).

Owner:	Contractor:
Town of Ayer, MA *(typed or printed name of organization)*	_____ *(typed or printed name of organization)*
By: _____ *(individual's signature)*	By: _____ *(individual's signature)*
Date: _____ *(date signed)*	Date: _____ *(date signed)*
Name: _____ *(typed or printed)*	Name: _____ *(typed or printed)*
Title: _____ *(typed or printed)*	Title: _____ *(typed or printed)* *(If **[Type of Entity]** is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*
Attest: _____ *(individual's signature)*	Attest: _____ *(individual's signature)*
Title: _____ *(typed or printed)*	Title: _____ *(typed or printed)*
Address for giving notices: Department of Public Works 25 Brook Street Ayer, MA 01432	Address for giving notices: _____
Designated Representative:	Designated Representative:
Name: _____ *(typed or printed)*	Name: _____ *(typed or printed)*
Title: _____ *(typed or printed)*	Title: _____ *(typed or printed)*
Address:	Address:
_____	_____
Phone: _____	Phone: _____
Email: _____ *(If **[Type of Entity]** is a corporation, attach evidence of authority to sign. If **[Type of Entity]** is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)*	Email: _____ License No.: _____ *(where applicable)* State: _____

PERFORMANCE BOND

Contractor	**Surety**
Name:	Name:
Address *(principal place of business)*:	Address *(principal place of business)*:
Owner	**Contract**
Name: **Town of Ayer, MA**	Description *(name and location)*:
Mailing address *(principal place of business)*:	**Sandy Pond Road Sanitary Sewer Rehabilitation**
Department of Public Works **25 Brook Street** **Ayer, MA 01432**	Contract Price: Effective Date of Contract:

Bond

Bond Amount:

Date of Bond:

(Date of Bond cannot be earlier than Effective Date of Contract)

Modifications to this Bond form:

☒ None ☐ See Paragraph 16

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

Contractor as Principal	Surety
_____	_____
(Full formal name of Contractor)	*(Full formal name of Surety) (corporate seal)*
By: _____	By: _____
(Signature)	*(Signature)(Attach Power of Attorney)*
Name: _____	Name: _____
(Printed or typed)	*(Printed or typed)*
Title: _____	Title: _____
Attest: _____	Attest: _____
(Signature)	*(Signature)*
Name: _____	Name: _____
(Printed or typed)	*(Printed or typed)*
Title: _____	Title: _____

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

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

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

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

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

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

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

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

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

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

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

    5.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

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

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

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

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

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

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

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

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

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

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

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

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

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

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

14. Definitions

    14.1. *Balance of the Contract Price*—The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

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

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

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

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

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

16. Modifications to this Bond are as follows: **None**

PAYMENT BOND

Contractor	**Surety**
Name:	Name:
Address *(principal place of business)*:	Address *(principal place of business)*:
Owner	**Contract**
Name: **Town of Ayer, MA**	Description *(name and location)*: **Sandy Pond Road Sanitary Sewer Rehabilitation**
Mailing address *(principal place of business)*: **Department of Public Works 25 Brook Street Ayer, MA 01432**	Contract Price:
	Effective Date of Contract:

Bond

Bond Amount:

Date of Bond:

(Date of Bond cannot be earlier than Effective Date of Contract)

Modifications to this Bond form:

☒ None ☐ See Paragraph 18

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

Contractor as Principal	Surety
_____	_____
(Full formal name of Contractor)	*(Full formal name of Surety) (corporate seal)*
By: _____	By: _____
(Signature)	*(Signature)(Attach Power of Attorney)*
Name: _____	Name: _____
(Printed or typed)	*(Printed or typed)*
Title: _____	Title: _____
Attest: _____	Attest: _____
(Signature)	*(Signature)*
Name: _____	Name: _____
(Printed or typed)	*(Printed or typed)*
Title: _____	Title: _____

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

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond will arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond will arise after the following:
    5.1. Claimants who do not have a direct contract with the Contractor
        5.1.1. have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
        5.1.2. have sent a Claim to the Surety (at the address described in Paragraph 13).
    5.2. Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
    7.1. Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
    7.2. Pay or arrange for payment of any undisputed amounts.

7.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

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

12. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.

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

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. Definitions

16.1. *Claim*—A written statement by the Claimant including at a minimum:

16.1.1. The name of the Claimant;

16.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;

16.1.3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;

16.1.4. A brief description of the labor, materials, or equipment furnished;

16.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;

16.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;

16.1.7. The total amount of previous payments received by the Claimant; and

16.1.8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2. *Claimant*—An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond is to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

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

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

16.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

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

18. Modifications to this Bond are as follows: **None**

WARRANTY BOND

Contractor	**Surety**
Name:	Name:
Address *(principal place of business)*:	Address *(principal place of business)*:
Owner	**Construction Contract**
Name: **Town of Ayer, MA**	Description *(name and location)*:
Address *(principal place of business)*:	**Sandy Pond Road Sanitary Sewer Rehabilitation**
Department of Public Works **25 Brook Street** **Ayer, MA 01432**	Contract Price: Effective Date of Contract: Contract's Date of Substantial Completion:

Bond

Bond Amount: _____

Date of Bond: _____

Bond Period: Commencing 364 days after Substantial Completion of the Work under the Construction Contract, and continuing until **two** years after such Substantial Completion.

Modifications to this Bond form:

☒ None ☐ See Paragraph 9

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

Contractor as Principal	Surety
_____	_____
(Full formal name of Contractor)	*(Full formal name of Surety) (corporate seal)*
By: _____	By: _____
(Signature)	*(Signature) (Attach Power of Attorney)*
Name: _____	Name: _____
(Printed or typed)	*(Printed or typed)*
Title: _____	Title: _____
Attest: _____	Attest: _____
(Signature)	*(Signature)*
Name: _____	Name: _____
(Printed or typed)	*(Printed or typed)*
Title:	Title:

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

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

2. If the Contractor performs the Correction Period Obligations, the Surety and the Contractor shall have no obligation under this Warranty Bond.

3. If Owner gives written notice to Contractor and Surety during the Bond Period of Contractor's obligation under the Correction Period Obligations, and Contractor does not fulfill such obligation, then Surety shall be responsible for fulfillment of such Correction Period Obligations. Surety shall either fulfill the Correction Period Obligations itself, through its agents or contractors, or, in the alternative, Surety may waive the right to fulfill the Correction Period Obligations itself, and reimburse the Owner for all resulting costs incurred by Owner in performing Contractor's Correction Period Obligations, including but not limited to correction, removal, replacement, and repair costs.

4. The Surety's liability is limited to the amount of this Warranty Bond. Renewal or continuation of the Warranty Bond will not modify such amount, unless expressly agreed to by Surety in writing.

5. The Surety shall have no liability under this Warranty Bond for obligations of the Contractor that are unrelated to the Construction Contract. No right of action will accrue on this Warranty Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

6. Any proceeding, legal or equitable, under this Warranty Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and must be instituted within two years after the Surety refuses or fails to perform its obligations under this Warranty Bond.

7. Written notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown in this Warranty Bond.

8. Definitions

    8.1. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page of this Warranty Bond, including all Contract Documents and changes made to the agreement and the Contract Documents.

    8.2. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

    8.3. *Correction Period Obligations*—The duties, responsibilities, commitments, and obligations of the Contractor with respect to correction or replacement of defective Work, as set forth in the Construction Contract's Correction Period clause, EJCDC® C-700, Standard General Conditions of the Construction Contract (2018), Paragraph 15.08, as duly modified.

    8.4. *Substantial Completion*—As defined in the Construction Contract.

    8.5. *Work*—As defined in the Construction Contract.

9. Modifications to this Bond are as follows: **None**

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared By

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ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*

a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the

requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.

c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.

d. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.

21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.

23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.

    a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.

    b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.

    c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.

25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.

28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.

32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.

34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.

36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.

39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.

44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

46. *Technical Data*

    a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.

    b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.

    c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.

47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.

48. *Unit Price Work*—Work to be paid for on the basis of unit prices.

49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*: The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day*: The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*: The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

1. does not conform to the Contract Documents;

2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

3. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).

E. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. *Contract Price or Contract Times*: References to a change in "Contract Price or Contract Times" or "Contract Times or Contract Price" or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term "or both" is not expressed.

G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).

B. *Evidence of Contractor's Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.

C. *Evidence of Owner's Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work

into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.

B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

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

G. Nothing in the Contract Documents creates:

1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or

2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 *Reference Standards*

A. *Standards Specifications, Codes, Laws and Regulations*

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility

inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

4.03 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the

established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. Abnormal weather conditions;

3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and

4. Acts of war or terrorism.

D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:

1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.

2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.

3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.

E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:

1. The circumstances that form the basis for the requested adjustment;

2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;

3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;

4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and

5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.

G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

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

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment

and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;

2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and

3. Technical Data contained in such reports and drawings.

B. *Underground Facilities*: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

C. *Reliance by Contractor on Technical Data*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

D. *Limitations of Other Data and Documents*: Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;

3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or

4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;

2. is of such a nature as to require a change in the Drawings or Specifications;

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

E. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in

Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;

b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

c. Contractor failed to give the written notice required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:

1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;

4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.

C. *Engineer's Review*: Engineer will:

1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;

2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;

3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and

4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

F. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and

c. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;

2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures

of construction to be employed by Contractor, and safety precautions and programs incident thereto;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.

H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

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

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.

B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.

C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.

E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.

F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.

H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Alternative forms of insurance coverage, including but not limited to self-insurance and "Occupational Accident and Excess Employer's Indemnity Policies," are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.

D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.

F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

H. Contractor shall require:

1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and

2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.

I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.

K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.

M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.

N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

A. *Required Insurance*: Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.

B. *General Provisions*: The policies of insurance required by this Paragraph 6.03 as supplemented must:

1. include at least the specific coverages required;

2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;

3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;

4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and

5. include all necessary endorsements to support the stated requirements.

C. *Additional Insureds*: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:

1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;

2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;

3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and

5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.

B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.

C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.

E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against

Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.

1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.

C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.

D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.

B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.

C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 *"Or Equals"*

A. *Contractor's Request; Governing Criteria*: Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that the proposed item:

1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

3) has a proven record of performance and availability of responsive service; and

4) is not objectionable to Owner.

b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 *Substitutes*

A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:

    a. will certify that the proposed substitute item will:

        1) perform adequately the functions and achieve the results called for by the general design;

        2) be similar in substance to the item specified; and

        3) be suited to the same use as the item specified.

    b. will state:

        1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;

        2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

        3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

    c. will identify:

        1) all variations of the proposed substitute item from the item specified; and

        2) available engineering, sales, maintenance, repair, and replacement services.

    d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.

B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.

E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.

F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.

J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.

K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.

L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.

M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.09 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.11 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.

C. Owner or Contractor may give w ritten notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.

B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.

C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.

F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.

H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).

J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:

a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determine and verify:

1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;

2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;

c. confirm that the Submittal is complete with respect to all related data included in the Submittal.

2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.

1. *Shop Drawings*

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.

2. *Samples*

a. Contractor shall submit the number of Samples required in the Specifications.

b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Engineer's Review of Shop Drawings and Samples*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will

document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. *Resubmittal Procedures for Shop Drawings and Samples*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.

2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. *Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs*

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:

   a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.

   b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.

   c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.

2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03. 2.04, and 2.05.

F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.

B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:

1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and

2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.

C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:

1. Observations by Engineer;

2. Recommendation by Engineer or payment by Owner of any progress or final payment;

3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. Use or occupancy of the Work or any part thereof by Owner;

5. Any review and approval of a Shop Drawing or Sample submittal;

6. The issuance of a notice of acceptability by Engineer;

7. The end of the correction period established in Paragraph 15.08;

8. Any inspection, test, or approval by others; or

9. Any correction of defective Work by Owner.

E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 *Delegation of Professional Design Services*

A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.

B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.

C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.

E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:

1. Checking for conformance with the requirements of this Paragraph 7.19;

2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and

3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.

F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.

G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.

D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. An itemization of the specific matters to be covered by such authority and responsibility; and

3. The extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.

1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.

2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.

C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Resident Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.

B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

A. Engineer has the authority to reject Work in accordance with Article 14.

B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.

C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.

D. Engineer's authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.

C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and

4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

B. If Owner has issued a Work Change Directive and:

1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.

2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.

B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.

B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.

C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or
3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit will be determined as follows:
   1. A mutually acceptable fixed fee; or
   2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
      a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
      b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
      c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
      d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
      e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
      f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.

B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

A. *Purpose and Content*: Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

B. *Change Proposal Procedures*

1. *Submittal*: Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.

2. *Supporting Data*: The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.

    a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.

    b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

    The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review*: Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.

4. *Engineer's Full Review and Action on the Change Proposal*: Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change

Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and

4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge

and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

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

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.

5. Other costs consisting of the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are

consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.

2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.

3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work does not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. The cost of purchasing, renting, or furnishing small tools and hand tools.

3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

6. Expenses incurred in preparing and advancing Claims.

7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*

1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:

a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.

b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:

1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.

2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.

2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.

C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision

thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:

a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.

2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.

3. Adjusted unit prices will apply to all units of that item.

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

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs,

losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

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

14.05 *Uncovering Work*

A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work,

or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.

2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

   a. the Work has progressed to the point indicated;

   b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

   c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

   a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

   b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

    a. to supervise, direct, or control the Work;

    b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;

    c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;

    d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or

    e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

    a. the Work is defective, requiring correction or replacement;

    b. the Contract Price has been reduced by Change Orders;

    c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

    d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

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

D. *Payment Becomes Due*

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

E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

    a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. The Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

h. The Contract Price has been reduced by Change Orders;

i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;

j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or

l. Other items entitle Owner to a set-off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without

significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.

2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

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

15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.

2. The final Application for Payment must be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents;

   b. consent of the surety, if any, to final payment;

   c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

d. a list of all duly pending Change Proposals and Claims; and

e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Final Application and Recommendation of Payment*: If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Notice of Acceptability*: In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.

D. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.

E. *Final Payment Becomes Due*: Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,

appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such adjacent areas;
2. correct such defective Work;
3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.

B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.

C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.

D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects,

attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The

provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and

2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:

1. in person, by a commercial courier service or otherwise, to the recipient's place of business;

2. by registered or certified mail, postage prepaid, to the recipient's place of business; or

3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

18.07 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Assignment of Contract*

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

18.09 *Successors and Assigns*

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

18.10 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

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SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

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

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

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

Article 1—**DEFINITIONS AND TERMINOLOGY**

SC-1.01.A.16 Add the following to Paragraph 1.01.A.16:

The terms “Contractor” and “CONTRACTOR” have the same meaning.

SC-1.01.A.16 Add the following to Paragraph 1.01.A.16:

Whenever the Project is to be constructed under multiple direct Contracts, the term “Contractor” shall mean the appropriate prime Contractor. Whenever a specific prime Contractor is referred to, terms such as “General Contractor”, “Electrical Contractor”, “Plumbing Contractor”, “HVAC Contractor”, or other appropriate Contract-indicating term will be used. The terms “Contractor” and “CONTRACTOR” have the same meaning.

SC-1.01.A.22 Add the following to Paragraph 1.01.A.22:

The terms “Engineer” and “ENGINEER” have the same meaning.

SC-1.01.A.30 Add a new sentence to Paragraph 1.01.A.30 that is to read as follows:

The terms “Owner” and “OWNER” have the same meaning.

SC-1.01.A.40 Add a new sentence to Paragraph 1.01.A.40 that is to read as follows:

Trucking, shipping, and delivery firms, consultants, and entities performing testing or inspection retained by Contractor or any Subcontractor are considered to be Subcontractors.

SC-1.01.A.45 Add a new sentence to Paragraph 1.01.A.45 that is to read as follows:

Entities that rent construction equipment or machinery, but are not incorporated into the Work, are considered to be Suppliers. If such rental entity furnishes both equipment and one or more personnel to operate and maintain the equipment, such entity is a Subcontractor.

Article 2—**PRELIMINARY MATTERS**

2.01 *Delivery of Bonds and Evidence of Insurance*

SC-2.01 Delete Paragraphs 2.01.B. and C. in their entirety and insert the following in their place:

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

C. *Evidence of Owner's Insurance:* After receipt from Contractor of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor copies of the policies of insurance to be provided by Owner in this Contract (if any). Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

2.02 *Copies of Documents*

SC-2.02 Amend the first sentence of Paragraph 2.02.A. to read as follows:

Owner shall furnish to one fully signed counterpart of the Agreement, and one copy of the Contract Documents in electronic portable document format (PDF).

2.06 *Electronic Transmittals*

SC-2.06 Delete Paragraph 2.06.B in its entirety and insert the following in its place:

B. Electronic Means are established in Specification Section 01 31 26, Electronic Document Protocol.

SC-2.06 Supplement Paragraph 2.06 of the General Conditions by adding the following paragraph:

D. *Requests by Contractor for Electronic Documents in Other Formats*

1. Release of any Electronic Document versions of the Project documents in formats other than those identified in the Electronic Documents Protocol (if any) or elsewhere in the Contract will be at the sole discretion of the Owner.

2. To extent determined by Owner, in its sole discretion, to be prudent and necessary, release of Electronic Documents versions of Project documents and other Project information requested by Contractor ("Request") in formats other than those identified in the Electronic Documents Protocol (if any) or elsewhere in the Contract will be subject to the provisions of the Owner's response to the Request, and to the following conditions to which Contractor agrees:

a. The content included in the Electronic Documents created by Engineer and covered by the Request was prepared by Engineer as an internal working document for Engineer's purposes solely, and is being provided to Contractor on an "AS IS" basis without any warranties of any kind, including, but not limited to any implied warranties of fitness for any purpose. As such, Contractor is advised and acknowledges that the content may not be suitable for Contractor's application, or may require substantial modification and independent verification by Contractor.

The content may include limited resolution of models, not-to-scale schematic representations and symbols, use of notes to convey design concepts in lieu of accurate graphics, approximations, graphical simplifications, undocumented intermediate revisions, and other devices that may affect subsequent reuse.

b. Electronic Documents containing text, graphics, metadata, or other types of data that are provided by Engineer to Contractor under the request are only for convenience of Contractor. Any conclusion or information obtained or derived from such data will be at the Contractor's sole risk and the Contractor waives any claims against Engineer or Owner arising from use of data in Electronic Documents covered by the Request.

c. Contractor shall indemnify and hold harmless Owner and Engineer and their subconsultants from all claims, damages, losses, and expenses, including attorneys' fees and defense costs arising out of or resulting from Contractor's use, adaptation, or distribution of any Electronic Documents provided under the Request.

d. Contractor agrees not to sell, copy, transfer, forward, give away or otherwise distribute this information (in source or modified file format) to any third party without the direct written authorization of Engineer, unless such distribution is specifically identified in the Request and is limited to Contractor's subcontractors. Contractor warrants that subsequent use by Contractor's subcontractors complies with all terms of the Contract Documents and Owner's response to Request.

e. Contractor agrees to execute ENGINEER's standard agreement for release of electronic files (copy attached to Specification Section 01 n78 39. Record Documents) and shall abide by the provisions of such agreement for release of electronic files.

3. In the event that Owner elects to provide or directs the Engineer to provide to Contractor any Contractor-requested Electronic Document versions of Project information that is not explicitly identified in the Contract Documents as being available to Contractor, the Owner shall be reimbursed by Contractor on an hourly basis (at $200 per hour) for any engineering costs necessary to create or otherwise prepare the data in a manner deemed appropriate by Engineer.

Article 3—**CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE**

No suggested Supplementary Conditions in this Article.

Article 4—**COMMENCEMENT AND PROGRESS OF THE WORK**

No suggested Supplementary Conditions in this Article.

Article 5—**SITE, SUBSURFACE AND PHYSICAL CONDITIONS, HAZARDOUS ENVIRONMENTAL CONDITIONS**

SC-5.03 Add the following new paragraphs immediately after Paragraph 5.03.D:

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

Report Title	Date of Report	Technical Data
Not applicable (no reports known to Owner)	-	-

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

Drawings Title	Date of Drawings	Technical Data
Not applicable (no drawings known to Owner)	-	-

5.06 *Hazardous Environmental Conditions*

SC-5.06 Add the following new paragraphs immediately after Paragraph 5.06.A.3:

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

Report Title	Date of Report	Technical Data
Not applicable (no reports known to Owner)	-	-

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

Drawings Title	Date of Drawings	Technical Data
Not applicable (no drawings known to Owner)	-	-

Article 6— **BONDS AND INSURANCE**

6.01 *Performance, Payment, and Other Bonds*

SC-6.01 Add the following paragraphs immediately after Paragraph 6.01.A:

1. *Required Performance Bond Form:* The performance bond that Contractor furnishes will be in the form of EJCDC® C-610, Performance Bond (2010, 2013, or 2018 edition).

2. *Required Payment Bond Form:* The payment bond that Contractor furnishes will be in the form of EJCDC® C-615, Payment Bond (2010, 2013, or 2018 edition).

SC-6.01 Add the following paragraphs immediately after Paragraph 6.01.B:

1. The correction period specified as one year after the date of Substantial Completion in Paragraph 15.08.A of the General Conditions is hereby revised to be 2 years after Substantial Completion.

2. After Substantial Completion, Contractor shall furnish a warranty bond issued in the form of EJCDC® C-612, Warranty Bond (2018). The warranty bond must be in a bond amount of 10 percent of the final Contract Price. The warranty bond period will extend to a date 2 years after Substantial Completion of the Work. Contractor shall deliver the fully executed warranty bond to Owner prior to or with the final application for payment, and in any event no later than 11 months after Substantial Completion. The warranty bond shall not supersede or replace any individual warranties required for construction workmanship, installations, work, products, and materials as specified in the technical specifications of the Contract Documents.

3. The warranty bond must be issued by the same surety that issues the performance bond required under Paragraph 6.01.A of the General Conditions.

6.03 *Contractor's Insurance*

SC-6.03 Supplement Paragraph 6.03 with the following provisions after Paragraph 6.03.C:

D. *Workers' Compensation and Employer's Liability:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance, including, as applicable, United States Longshoreman and Harbor Workers' Compensation Act, Jones Act, stop-gap employer's liability coverage for monopolistic states, and foreign voluntary workers' compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

Workers' Compensation and Related Policies	**Policy limits of not less than:**
Workers' Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory
Employer's Liability	
Each accident	$1,000,000
Each employee	$1,000,000
Policy limit	$1,000,000

E. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:

1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,

2. damages insured by reasonably available personal injury liability coverage, and

3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

F. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage.

   a. Such insurance must be maintained for three years after final payment.

   b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.

2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations as specified in Paragraph 7.18 of the General Conditions.

3. Severability of interests and no insured-versus-insured or cross-liability exclusions.

4. Underground, explosion, and collapse coverage.

5. Personal injury coverage.

6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.

7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

G. *Commercial General Liability—Excluded Content:* The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:

1. Any modification of the standard definition of "insured contract" (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).

2. Any exclusion for water intrusion or water damage.

3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.

4. Any exclusion of coverage relating to earth subsidence or movement.

5. Any exclusion for the insured's vicarious liability, strict liability, or statutory liability (other than worker's compensation).

6. Any limitation or exclusion based on the nature of Contractor's work.

7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

H. *Commercial General Liability—Minimum Policy Limits*

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

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

Automobile Liability	Policy limits of not less than:
Bodily Injury	
Each Person	$1,000,000
Each Accident	$1,000,000
Property Damage	
Each Accident	$1,000,000
[or]	
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	$5,000,000

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

Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	$2,000,000
General Aggregate	$2,000,000

SC-6.04 Supplement Paragraph 6.04 of the General Conditions with the following provisions:

F. *Builder's Risk Requirements:* The builder's risk insurance must:

1. be written on a builder's risk "all risk" policy form that at a minimum includes insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment stored and in transit, and must not exclude the coverage of the following risks: fire; windstorm; hail; flood; earthquake, volcanic activity, and other earth movement; lightning; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and

artificially generated electric current; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; and water damage (other than that caused by flood).

a. Such policy will include an exception that results in coverage for ensuing losses from physical damage or loss with respect to any defective workmanship, methods, design, or materials exclusions.

b. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake, volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance will be provided through other insurance policies acceptable to Owner and Contractor.

2. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

3. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of contractors, engineers, and architects).

4. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).

5. extend to cover damage or loss to insured property while in transit.

6. allow for the waiver of the insurer's subrogation rights, as set forth in this Contract.

7. allow for partial occupancy or use by Owner by endorsement, and without cancellation or lapse of coverage.

8. include performance/hot testing and start-up, if applicable.

9. be maintained in effect until the Work is complete, as set forth in Paragraph 15.06.D of the General Conditions, or until written confirmation of Owner's procurement of property insurance following Substantial Completion, whichever occurs first.

SC-6.04 Supplement Paragraph 6.04 of the General Conditions with the following provisions:

H. *Builder's Risk and Other Property Insurance Deductibles:* The purchaser of any required builder's risk, installation floater, or other property insurance will be responsible for costs not covered because of the application of a policy deductible.

Article 7—**CONTRACTOR'S RESPONSIBILITIES**

7.02 *Supervision and Superintendence*

SC-7.02 Amend Paragraph 7.02.B of the General Conditions by adding the following sentence:

Unless the Owner otherwise agrees in writing, the superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

SC-7.02 Add the following new subparagraph immediately after Paragraph 7.02.B:

C. The Contractor's superintendent is required to be on site for all hours or each day that work under the Contract is performed, whether such work is being completed by the Contractor or any subcontractor or supplier.

7.03 *Labor; Working Hours*

SC-7.03 Add the following new subparagraphs immediately after Paragraph 7.03.C:

1. Regular working hours will be defined as up to eight hours per day, beginning no earlier than 7:00 a.m. and ending no later than 5:00 p.m.

2. Owner's legal holidays are New Year's Day (or observed day), Martin Luther King Day, President's Day, Good Friday, Memorial Day, Juneteenth, Independence Day, Labor Day, Columbus Day, Veterans' Day, Thanksgiving Day, Day After Thanksgiving, Christmas Eve (or observed day), Christmas Day (or observed day), and New Year's Eve (or observed day).

3. If it shall become absolutely necessary to perform Work at night or on Saturdays, Sundays, or legal holidays, written notice shall be submitted to Owner and Engineer at least three days in advance of the need for such Work. Owner will only consider the performance of such Work as can be performed satisfactorily under the conditions. Good lighting and all other necessary facilities for carrying out and observing the Work shall be provided and maintained where such Work is being performed at night.

SC-7.03 Amend the first and second sentences of Paragraph 7.03.C to state "…all Work at the Site must be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. "

SC-7.03 Add the following new paragraph immediately after Paragraph 7.03.C:

D. Owner shall be responsible for the cost of any overtime pay or other expense incurred by the Owner for Engineer's services (including those of the Resident Project Representative, if any), Owner's representative, and construction observation services, occasioned by the performance of Work on Saturday, Sunday, any legal holiday, or as overtime on any regular work day. If Contractor is responsible but does not pay, or if the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

7.10 *Taxes*

SC-7.10 Add a new paragraph immediately after Paragraph 7.10.A:

A. Owner is exempt from payment of sales and compensating use taxes of the State of Massachusetts and of cities and counties thereof on all materials to be incorporated into the Work.

1. Owner will furnish the required certificates of tax exemption to Contractor for use in the purchase of supplies and materials to be incorporated into the Work.

2. Owner's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by Contractor, or to supplies or materials not incorporated into the Work.

7.14 *Hazard Communication Programs*

SC-7.14 Add the following new paragraph immediately after Paragraph 7.14.A:

B. Contractor shall provide a centralized location for the maintenance of the safety data sheets or other hazard communication information required to be made available by any employer on the Site. Location of the safety data sheets or other hazard communication information shall be readily accessible to the employees of all employers on the Site.

Article 8—**OTHER WORK AT THE SITE**

No suggested Supplementary Conditions in this Article.

Article 9—**OWNER'S RESPONSIBILITIES**

No suggested Supplementary Conditions in this Article.

Article 10—**ENGINEER'S STATUS DURING CONSTRUCTION**

10.03 *Resident Project Representative*

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.B:

C. The Resident Project Representative (RPR) will be Engineer's representative at the Site. RPR's dealings in matters pertaining to the Work in general will be with Engineer and Contractor. RPR's dealings with Subcontractors will only be through or with the full knowledge or approval of Contractor. The RPR will:

1. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings (but not including Contractor's safety meetings), and as appropriate prepare and circulate copies of minutes thereof.

2. *Safety Compliance:* Comply with Site safety programs, as they apply to RPR, and if required to do so by such safety programs, receive safety training specifically related to RPR's own personal safety while at the Site.

3. *Liaison*

a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.

b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.

c. Assist in obtaining from Owner additional details or information, when required for Contractor's proper execution of the Work.

4. *Review of Work; Defective Work*

a. Conduct on-Site observations of the Work to assist Engineer in determining, to the extent set forth in Paragraph 10.02, if the Work is in general proceeding in accordance with the Contract Documents.

b. Observe whether any Work in place appears to be defective.

c. Observe whether any Work in place should be uncovered for observation, or requires special testing, inspection or approval.

5. *Inspections and Tests*

a. Observe Contractor-arranged inspections required by Laws and Regulations, including but not limited to those performed by public or other agencies having jurisdiction over the Work.

b. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Work.

6. *Payment Requests:* Review Applications for Payment with Contractor.

7. *Completion*

a. Participate in Engineer's visits regarding Substantial Completion.

b. Assist in the preparation of a punch list of items to be completed or corrected.

c. Participate in Engineer's visit to the Site in the company of Owner and Contractor regarding completion of the Work, and prepare a final punch list of items to be completed or corrected by Contractor.

d. Observe whether items on the final punch list have been completed or corrected.

D. The RPR will not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).

2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.

3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.

4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction.

5 Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.

6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.

7. Authorize Owner to occupy the Project in whole or in part.

Article 11—**CHANGES TO THE CONTRACT**

No suggested Supplementary Conditions in this Article.

Article 12—**CLAIMS**

No suggested Supplementary Conditions in this Article.

Article 13—**COST OF WORK; ALLOWANCES, UNIT PRICE WORK**

13.03 *Unit Price Work*

SC-13.03 Delete Paragraph 13.03.E in its entirety and insert the following in its place:

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:

   a. the extended price of a particular item of Unit Price Work amounts to 5 percent or more of the Contract Price (based on estimated quantities at the time of Contract formation) and the variation in the quantity of that particular item of Unit Price Work actually furnished or performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and

   b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.

2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.

3. Adjusted unit prices will apply to all units of that item.

Article 14—**TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCCEPTANCE OF DEFECTIVE WORK**

No suggested Supplementary Conditions in this Article.

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

No suggested Supplementary Conditions in this Article.

Article 16—**SUSPENSION OF WORK AND TERMINATION**

No suggested Supplementary Conditions in this Article.

Article 17—**FINAL RESOLUTIONS OF DISPUTES**

No suggested Supplementary Conditions in this Article.

Article 18—**MISCELLANEOUS**

SC-18.07 Add the following new subparagraph immediately after Subparagraph GC-18.07 B

B. Laws or Regulations which, by provision of Laws and Regulations, are required to be included in the Contract Documents. The material included as EXHIBIT A may not be complete or current. Contractor's obligation to comply with all Laws and Regulations applicable to the Work' is set forth in Paragraph 7.01 of the General Conditions.

SC-18.11 Add the following new paragraph immediately after Paragraph GC-18.10 :

SC-18.11 *Confidential Information*

A. All Drawings, Specifications, technical data, and other information furnished to Contractor either by Owner or Engineer or developed by Contractor or others in connection with the Work are, and will remain, the property of Owner or Engineer, and shall not be copied or otherwise reproduced or used in any way except in connection with the Work, or disclosed to third parties or used in any manner detrimental to the interests of Owner or Engineer.

B. The following information is not subject to the above confidentiality requirements:

1. information in the public domain through no action of Contractor in breach of the Contract Documents; or
2. information lawfully possessed by Contractor before receipt from Owner or Engineer; or
3. information required to be disclosed by Laws or Regulations, or by a court or agency of competent jurisdiction. However, in the event Contractor shall be so required to disclose such information, Contractor shall, prior to disclosure, provide reasonable notice to Owner and Engineer, who shall have the right to interpose all objections Owner may have to the disclosure of such information.

SC-18-12 Add the following new paragraph after Paragraph 18-11**:**

18-12 *Publicity*

A. Contractor shall not disclose to any third party the nature of its Work on the Project, nor engage in publicity or public media disclosures with respect to the Project without the prior written consent of Owner.

Chapter 30: Section 39F Construction contracts; assignment and subrogation; subcontractor defined; enforcement of claim for direct payment; deposit, reduction of disputed amounts

Section 39F. (1) Every contract awarded pursuant to sections forty-four A to L, inclusive, of chapter one hundred and forty-nine shall contain the following subparagraphs (a) through (i) and every contract awarded pursuant to section thirty-nine M of chapter thirty shall contain the following subparagraphs (a) through (h) and in each case those subparagraphs shall be binding between the general contractor and each subcontractor.

(a) Forthwith after the general contractor receives payment on account of a periodic estimate, the general contractor shall pay to each subcontractor the amount paid for the labor performed and the materials furnished by that subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.

(b) Not later than the sixty-fifth day after each subcontractor substantially completes his work in accordance with the plans and specifications, the entire balance due under the subcontract less amounts retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the subcontractor; and the awarding authority shall pay that amount to the general contractor. The general contractor shall forthwith pay to the subcontractor the full amount received from the awarding authority less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.

(c) Each payment made by the awarding authority to the general contractor pursuant to subparagraphs (a) and (b) of this paragraph for the labor performed and the materials furnished by a subcontractor shall be made to the general contractor for the account of that subcontractor; and the awarding authority shall take reasonable steps to compel the general contractor to make each such payment to each such subcontractor. If the awarding authority has received a demand for direct payment from a subcontractor for any amount which has already been included in a payment to the general contractor or which is to be included in a payment to the general contractor for payment to the subcontractor as provided in subparagraphs (a) and (b), the awarding authority shall act upon the demand as provided in this section.

(d) If, within seventy days after the subcontractor has substantially completed the subcontract work, the subcontractor has not received from the general contractor the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, the subcontractor may demand direct payment of that balance from the awarding authority. The demand shall be by a sworn statement delivered to or sent by certified mail to the awarding authority, and a copy shall be delivered to or sent by certified mail to the general contractor at the same time. The demand shall contain a detailed breakdown of the balance due under the subcontract and also a statement of the status of completion of the subcontract work. Any demand made after substantial completion of the subcontract work shall be valid even if delivered or mailed prior to the seventieth day after the subcontractor has substantially completed the subcontract work. Within ten days after the subcontractor has delivered or so mailed the demand to the awarding authority and delivered or so mailed a copy to the general contractor, the general contractor may reply to the demand. The reply shall be by a sworn statement delivered to or sent by certified mail to the awarding authority and a copy shall be delivered to or sent by certified mail to the subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor and of the amount due for each claim made by the general contractor against the subcontractor.

(e) Within fifteen days after receipt of the demand by the awarding authority, but in no event prior to the seventieth day after substantial completion of the subcontract work, the awarding authority shall make direct payment to the subcontractor of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount (i) retained by the awarding authority as the estimated cost of completing the incomplete or unsatisfactory items of work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the general contractor in the sworn reply; provided, that the awarding authority shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by subparagraph (d). The awarding authority shall make further direct payments to the subcontractor forthwith after the removal of the basis for deductions from direct payments made as provided in parts (i) and (ii) of this subparagraph.

(f) The awarding authority shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of subparagraph (e) in an interest-bearing joint account in the names of the general contractor and the subcontractor in a bank in Massachusetts selected by the awarding authority or agreed upon by the general contractor and the subcontractor and shall notify the general contractor and the subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the general contractor and the subcontractor or as determined by decree of a court of competent jurisdiction.

(g) All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to subparagraph (f) shall be made out of amounts payable to the general contractor at the time of receipt of a demand for direct payment from a subcontractor and out of amounts which later become payable to the general contractor and in the order of receipt of such demands from

subcontractors. All direct payments shall discharge the obligation of the awarding authority to the general contractor to the extent of such payment.

(h) The awarding authority shall deduct from payments to a general contractor amounts which, together with the deposits in interest-bearing accounts pursuant to subparagraph (f), are sufficient to satisfy all unpaid balances of demands for direct payment received from subcontractors. All such amounts shall be earmarked for such direct payments, and the subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the general contractor.

(i) If the subcontractor does not receive payment as provided in subparagraph (a) or if the general contractor does not submit a periodic estimate for the value of the labor or materials performed or furnished by the subcontractor and the subcontractor does not receive payment for same when due less the deductions provided for in subparagraph (a), the subcontractor may demand direct payment by following the procedure in subparagraph (d) and the general contractor may file a sworn reply as provided in that same subparagraph. A demand made after the first day of the month following that for which the subcontractor performed or furnished the labor and materials for which the subcontractor seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the general contractor. Thereafter the awarding authority shall proceed as provided in subparagraph (e), (f), (g) and (h).

(2) Any assignment by a subcontractor of the rights under this section to a surety company furnishing a bond under the provisions of section twenty-nine of chapter one hundred forty-nine shall be invalid. The assignment and subrogation rights of the surety to amounts included in a demand for direct payment which are in the possession of the awarding authority or which are on deposit pursuant to subparagraph (f) of paragraph (1) shall be subordinate to the rights of all subcontractors who are entitled to be paid under this section and who have not been paid in full.

(3) ""Subcontractor" as used in this section (i) for contracts awarded as provided in sections forty-four A to forty-four H, inclusive, of chapter one hundred forty-nine shall mean a person who files a sub-bid and receives a subcontract as a result of that filed sub-bid or who is approved by the awarding authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, (ii) for contracts awarded as provided in paragraph (a) of section thirty-nine M of chapter thirty shall mean a person approved by the awarding authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, and (iii) for contracts with the commonwealth not awarded as provided in forty-four A to forty-four H, inclusive, of chapter one hundred forty-nine shall also mean a person contracting with the general contractor to supply materials used or employed in a public works project for a price in excess of five thousand dollars.

(4) A general contractor or a subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposited as provided in subparagraph (f) of paragraph 1 by a petition in equity in the superior court against the other and the bank shall not be a necessary party. A subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in subparagraph (f) of paragraph 1 by a petition in equity in the superior court against the awarding authority and the general contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this paragraph. Sections fifty-nine and fifty-nine B of chapter two hundred thirty-one shall apply to such petitions. The court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to sections fifty-nine and fifty-nine B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal therefrom as from a final decree. The court shall not consolidate for trial the petition of any subcontractor with the petition of one or more subcontractors or the same general contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a subcontractor filing a demand for direct payment for which no funds due the general contractor are available for direct payment shall have a right to file a petition in court of equity against the awarding authority claiming a demand for direct payment is premature and such subcontractor must file the petition before the awarding authority has made a direct payment to the subcontractor and has made a deposit of the disputed portion as provided in part (iii) of subparagraph (e) and in subparagraph (f) of paragraph (1).

(5) In any petition to collect any claim for which a subcontractor has filed a demand for direct payment the court shall, upon motion of the general contractor, reduce by the amount of any deposit of a disputed amount by the awarding authority as provided in part (iii) of subparagraph (e) and in subparagraph (f) of paragraph (1) any amount held under a trustee writ or pursuant to a restraining order or injunction.

Chapter 30: Section 39G Completion of public works; semi-final and final estimates; payments; extra work; disputed items

Section 39G. Upon substantial completion of the work required by a contract with the commonwealth, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges and other highway structures, sewers and, water mains, airports and other public works, the contractor shall present in writing to the awarding authority its certification that the work has been substantially completed. Within twenty-one days thereafter, the awarding authority shall present to the contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the contract sufficient to demonstrate that the work has not been substantially completed. The awarding authority may include with such list a notice setting forth a reasonable time, which shall not in any event be prior to the contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the awarding authority fails to respond, by presentation of a written

declaration or itemized list as aforesaid, to the contractor's certification within the twenty-one day period, the contractor's certification shall take effect as the awarding authority's declaration that the work has been substantially completed.

Within sixty-five days after the effective date of a declaration of a substantial completion, the awarding authority shall prepare and forthwith send to the contractor for acceptance a substantial completion estimate for the quantity and price of the work done and all but one per cent retainage on that work, including the quantity, price and all but one per cent retainage for the undisputed part of each work item and extra work item in dispute but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory work items and less the total periodic payments made to date for the work. The awarding authority also shall deduct from the substantial completion estimate an amount equal to the sum of all demands for direct payment filed by subcontractors and not yet paid to subcontractors or deposited in joint accounts pursuant to section thirty-nine F, but no contract subject to said section thirty-nine F shall contain any other provision authorizing the awarding authority to deduct any amount by virtue of claims asserted against the contract by subcontractors, material suppliers or others.

If the awarding authority fails to prepare and send to the contractor any substantial completion estimate required by this section on or before the date herein above set forth, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such substantial completion estimate at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston from such date to the date on which the awarding authority sends that substantial completion estimate to the contractor for acceptance or to the date of payment therefor, whichever occurs first. The awarding authority shall include the amount of such interest in the substantial completion estimate.

Within fifteen days after the effective date of the declaration of substantial completion, the awarding authority shall send to the contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory work items, and, unless delayed by causes beyond his control, the contractor shall complete all such work items within forty-five days after the receipt of such list or before the then contract completion date, whichever is later. If the contractor fails to complete such work within such time, the awarding authority may, subsequent to seven days' written notice to the contractor by certified mail, return receipt requested, terminate the contract and complete the incomplete or unsatisfactory work items and charge the cost of same to the contractor.

Within thirty days after receipt by the awarding authority of a notice from the contractor stating that all of the work required by the contract has been completed, the awarding authority shall prepare and forthwith send to the contractor for acceptance a final estimate for the quantity and price of the work done and all retainage on that work less all payments made to date, unless the awarding authority's inspection shows that work items required by the contract remain incomplete or unsatisfactory, or that documentation required by the contract has not been completed. If the awarding authority fails to prepare and send to the contractor the final estimate within thirty days after receipt of notice of completion, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such final estimate at the rate hereinabove provided from the thirtieth day after such completion until the date on which the awarding authority sends the final estimate to the contractor for acceptance or the date of payment therefor, whichever occurs first, provided that the awarding authority's inspection shows that no work items required by the contract remain incomplete or unsatisfactory. Interest shall not be paid hereunder on amounts for which interest is required to be paid in connection with the substantial completion estimate as hereinabove provided. The awarding authority shall include the amount of the interest required to be paid hereunder in the final estimate.

The awarding authority shall pay the amount due pursuant to any substantial completion or final estimate within thirty-five days after receipt of written acceptance for such estimate from the contractor and shall pay interest on the amount due pursuant to such estimate at the rate hereinabove provided from that thirty-fifth day to the date of payment. Within 15 days, 30 days in the case of the commonwealth, after receipt from the contractor, at the place designated by the awarding authority, if such place is so designated, of a periodic estimate requesting payment of the amount due for the preceding periodic estimate period, the awarding authority shall make a periodic payment to the contractor for the work performed during the preceding periodic estimate period and for the materials not incorporated in the work but delivered and suitably stored at the site, or at some location agreed upon in writing, to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority, upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances. The awarding authority shall include with each such payment interest on the amount due pursuant to such periodic estimate at the rate herein above provided from the due date. In the case of periodic payments, the contracting authority may deduct from its payment a retention based on its estimate of the fair value of its claims against the contractor, a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and a retention to secure satisfactory performance of the contractual work not exceeding five per cent of the approved amount of any periodic payment, and the same right to retention shall apply to bonded subcontractors entitled to direct payment under section thirty-nine F of chapter thirty; provided, that a five per cent value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.

No periodic, substantial completion or final estimate or acceptance or payment thereof shall bar a contractor from reserving all rights to dispute the quantity and amount of, or the failure of the awarding authority to approve a quantity and amount of, all or part of any work item or extra work item.

Substantial completion, for the purposes of this section, shall mean either that the work required by the contract has been completed except for work having a contract price of less than one per cent of the then adjusted total contract price, or substantially all of the work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work required by the contract.

Chapter 30: Section 39I Deviations from plans and specifications

Section 39*I*. Every contractor having a contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or public works for the commonwealth, or of any political subdivision thereof, shall perform all the work required by such contract in conformity with the plans and specifications contained therein. No wilful and substantial deviation from said plans and specifications shall be made unless authorized in writing by the awarding authority or by the engineer or architect in charge of the work who is duly authorized by the awarding authority to approve such deviations. In order to avoid delays in the prosecution of the work required by such contract such deviation from the plans or specifications may be authorized by a written order of the awarding authority or such engineer or architect so authorized to approve such deviation. Within thirty days thereafter, such written order shall be confirmed by a certificate of the awarding authority stating: (1) If such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefor; (2) that the specified deviation does not materially injure the project as a whole; (3) that either the work substituted for the work specified is of the same cost and quality, or that an equitable adjustment has been agreed upon between the contracting agency and the contractor and the amount in dollars of said adjustment; and (4) that the deviation is in the best interest of the contracting authority.

Such certificate shall be signed under the penalties of perjury and shall be a permanent part of the file record of the work contracted for.

Whoever violates any provision of this section willfully and with intent to defraud shall be punished by a fine of not more than five thousand dollars or by imprisonment for not more than six months, or both.

Chapter 30: Section 39J Public construction contracts; effect of decisions of contracting body or administrative board

Section 39J. Notwithstanding any contrary provision of any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or public works by the commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount of the contract is more than five thousand dollars in the case of the commonwealth and more than two thousand dollars in the case of any county, city, town, district, board, commission or other public body, a decision, by the contracting body or by any administrative board, official or agency, or by any architect or engineer, on a dispute, whether of fact or of law, arising under said contract shall not be final or conclusive if such decision is made in bad faith, fraudulently, capriciously, or arbitrarily is unsupported by substantial evidence, or is based upon error of law.

Chapter 30: Section 39K Public building construction contracts; payments

Section 39K. Every contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building by the commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount is more than five thousand dollars in the case of the commonwealth and more than two thousand dollars in the case of any county, city, town, district, board, commission or other public body, shall contain the following paragraph:-- Within fifteen days (30 days in the case of the commonwealth, including local housing authorities) after receipt from the contractor, at the place designated by the awarding authority if such a place is so designated, of a periodic estimate requesting payment of the amount due for the preceding month, the awarding authority will make a periodic payment to the contractor for the work performed during the preceding month and for the materials not incorporated in the work but delivered and suitably stored at the site (or at some location agreed upon in writing) to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority, upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances, but less (1) a retention based on its estimate of the fair value of its claims against the contractor and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and less (3) a retention not exceeding five per cent of the approved amount of the periodic payment. After the receipt of a periodic estimate requesting final payment and within sixty-five days after (a) the contractor fully completes the work or substantially completes the work so that the value of the work remaining to be done is, in the estimate of the awarding authority, less than one per cent of the original contract price, or (b) the contractor substantially completes the work and the awarding authority takes possession for occupancy, whichever occurs first, the awarding authority shall pay the contractor the entire balance due on the contract less (1) a retention based on its estimate of the fair value of its claims against the contractor and of the cost of completing the incomplete and unsatisfactory items of work and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, or based on the record of payments by the contractor to the subcontractors under this contract if such record of payment indicates that the contractor has not paid subcontractors as provided in section thirty-nine F. If the awarding authority fails to make payment as herein provided, there shall be added to each such payment daily interest at the rate of three percentage points above the rediscount rate than charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen days (twenty-four days in the case of the commonwealth) after receipt of such a periodic estimate from the contractor, at the place designated by the awarding authority if such a place is so designated. The contractor agrees to pay to each subcontractor a portion of any such interest paid in accordance with the amount due each subcontractor.

The awarding authority may make changes in any periodic estimate submitted by the contractor and the payment due on said periodic estimate shall be computed in accordance with the changes so made, but such changes or any requirement for a corrected periodic estimate shall not affect

the due date for the periodic payment or the date for the commencement of interest charges on the amount of the periodic payment computed in accordance with the changes made, as provided herein; provided, that the awarding authority may, within seven days after receipt, return to the contractor for correction, any periodic estimate which is not in the required form or which contains computations not arithmetically correct and, in that event, the date of receipt of such periodic estimate shall be the date of receipt of the corrected periodic estimate in proper form and with arithmetically correct computations. The date of receipt of a periodic estimate received on a Saturday shall be the first working day thereafter. The provisions of section thirty-nine G shall not apply to any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building to which this section applies.

All periodic estimates shall be submitted to the awarding authority, or to its designee as set forth in writing to the contractor, and the date of receipt by the awarding authority or its designee shall be marked on the estimate. All periodic estimates shall contain a separate item for each filed subtrade and each sub-subtrade listed in sub-bid form as required by specifications and a column listing the amount paid to each subcontractor and sub-subcontractor as of the date the periodic estimate is filed. The person making payment for the awarding authority shall add the daily interest provided for herein to each payment for each day beyond the due date based on the date of receipt marked on the estimate.

A certificate of the architect to the effect that the contractor has fully or substantially completed the work shall, subject to the provisions of section thirty-nine J, be conclusive for the purposes of this section.

Notwithstanding the provisions of this section, at any time after the value of the work remaining to be done is, in the estimation of the awarding authority, less than 1 per cent of the adjusted contract price, or the awarding authority has determined that the contractor has substantially completed the work and the awarding authority has taken possession for occupancy, the awarding authority may send to the general contractor by certified mail, return receipt requested, a complete and final list of all incomplete and unsatisfactory work items, including, for each item on the list, a good faith estimate of the fair and reasonable cost of completing such item. The general contractor shall then complete all such work items within 30 days of receipt of such list or before the contract completion date, whichever is later. If the general contractor fails to complete all incomplete and unsatisfactory work items within 45 days after receipt of such items furnished by the awarding authority or before the contract completion date, whichever is later, subsequent to an additional 14 days' written notice to the general contractor by certified mail, return receipt requested, the awarding authority may terminate the contract and complete the incomplete and unsatisfactory work items and charge the cost of same to the general contractor and such termination shall be without prejudice to any other rights or remedies the awarding authority may have under the contract. The awarding authority shall note any such termination in the evaluation form to be filed by the awarding authority pursuant to the provisions of section 44D of chapter 149.

Chapter 30: Section 39L Public construction work by foreign corporations; restrictions and reports

Section 39L. The commonwealth and every county, city, town, district, board, commission or other public body which, as the awarding authority, requests proposals, bids or sub-bids for any work in the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or other public works (1) shall not enter into a contract for such work with, and shall not approve as a subcontractor furnishing labor and materials for a part of any such work, a foreign corporation which has not filed with such awarding authority a certificate of the state secretary stating that such corporation has complied with sections three and five of chapter one hundred and eighty-one and the date of such compliance, and (2) shall report to the state secretary and to the department of corporations and taxation any foreign corporation performing work under such contract or subcontract, and any person, other than a corporation, performing work under such contract or subcontract, and residing or having a principal place of business outside the commonwealth.

Chapter 30: Section 39M Contracts for construction and materials; manner of awarding

Section 39M. (a) Every contract for the construction, reconstruction, alteration, remodeling or repair of any public work, or for the purchase of any material, as hereinafter defined, by the commonwealth, or political subdivision thereof, or by any county, city, town, district or housing authority that is and estimated by the awarding authority to cost less than $10,000 dollars shall be obtained through the exercise of sound business practices as defined in section 2 of chapter 30B. The awarding authority shall make and keep a record of each procurement that, at a minimum, shall include the name and address of the person from whom the services were procured. An awarding authority that utilizes a vendor on a statewide contract procured through the operational services division, or a blanket contract procured by the awarding authority pursuant to this section, shall be deemed to have obtained the contract through sound business practices.

Every contract for the construction, reconstruction, alteration, remodeling or repair of any public work, or for the purchase of any material, as hereinafter defined, by the commonwealth, or political subdivision thereof, or by any county, city, town, district or housing authority that is estimated by the awarding authority to cost not less than $10,000 but not more than $50,000 shall be awarded to the responsible bidder offering to perform the contract at the lowest price. The awarding authority shall make public notification of the contract and shall seek written responses from no fewer than 3 persons who customarily perform such work. For purposes of this subsection, the term "public notification" shall include, but need not be limited to, posting, at least 2 weeks before the time specified in the notification for the receipt of responses, the contract and scope-of-work statement: (1) on the website of the awarding authority, (2) on the COMMBUYS system administered by the operational services division, (3) in the central register published pursuant to section 20A of chapter 9 and (4) in a conspicuous place in or near the primary office of the awarding authority; provided, however, that if the awarding authority obtains a minimum of 2 written responses from a vendor list established through a blanket contract or a statewide contract procured through the operational services division, and the lowest of those written responses is deemed acceptable to the awarding authority, public notification is not required. The solicitation shall include a scope-of-work statement that defines the work to be performed and provides potential responders with sufficient information regarding the objectives and requirements of the awarding authority and the time period within which the work shall be completed. The awarding authority shall record the names and addresses

of all persons from whom written responses were sought, the names of the persons submitting written responses and the date and amount of each written response.

An awarding authority may utilize a vendor list established through a statewide contract procured through the operational services division to identify 1 or more of the persons from whom it will seek written responses for purposes of this subsection. An awarding authority may also procure a blanket contract to establish a listing of vendors in certain defined categories of work that are under contract to provide services for multiple individual tasks of not more than $50,000 each, and from whom written responses will be sought. Any such blanket contract procured by the awarding authority shall be procured pursuant to this section or sections 44A to 44J, inclusive, of chapter 149 which are applicable to projects over $50,000.

Every contract for the construction, reconstruction, alteration, remodeling or repair of any public work, or for the purchase of any material, as hereinafter defined, by the commonwealth, or political subdivision thereof, or by any county, city, town, district or housing authority that is estimated by the awarding authority to cost more than $50,000, and every contract for the construction, reconstruction, installation, demolition, maintenance or repair of any building by a public agency, as defined by subsection (1) of section 44A of chapter 149, estimated to cost more than $50,000 but not more than $150,000, shall be awarded to the lowest eligible responsible bidder on the basis of competitive bids publicly opened and read by the awarding authority forthwith upon expiration of the time for the filing thereof; provided, however, that such awarding authority may reject any and all bids, if it is in the public interest to do so. Every bid for such contract shall be accompanied by a bid deposit in the form of: (1) a bid bond, (2) cash, or (3) a certified check on, or a treasurer's or cashier's check issued by, a responsible bank or trust company, payable to the awarding authority. The amount of the bid deposit shall be 5 per cent of the value of the bid. Any person submitting a bid pursuant to this section shall, on such bid, certify as follows:

The undersigned certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this paragraph the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

(Name of person signing bid)

(Company)

This subsection shall not apply to the award of any contract subject to the provisions of sections 44A to 44J, inclusive, of chapter 149 and every such contract shall continue to be awarded as provided therein. In cases of extreme emergency: (1) caused by enemy attack, sabotage or other such hostile actions or (2) resulting from an imminent security threat explosion, fire, flood, earthquake, hurricane, tornado or other such catastrophe, an awarding authority may, without competitive bids and notwithstanding any general or special law, award contracts otherwise subject to this subsection to perform work and to purchase or rent materials and equipment, all as may be necessary for temporary repair and restoration to service of any and all public work in order to preserve the health and safety of persons or property; provided, that this exception shall not apply to any permanent reconstruction, alteration, remodeling or repair of any public work.

(b) Specifications for such contracts, and specifications for contracts awarded pursuant to the provisions of said sections forty-four A to forty-four L of said chapter one hundred and forty-nine, shall be written to provide for full competition for each item of material to be furnished under the contract; except, however, that said specifications may be otherwise written for sound reasons in the public interest stated in writing in the public records of the awarding authority or promptly given in writing by the awarding authority to anyone making a written request therefor, in either instance such writing to be prepared after reasonable investigation. Every such contract shall provide that an item equal to that named or described in the said specifications may be furnished; and an item shall be considered equal to the item so named or described if, in the opinion of the awarding authority: (1) it is at least equal in quality, durability, appearance, strength and design, (2) it will perform at least equally the function imposed by the general design for the public work being contracted for or the material being purchased, and (3) it conforms substantially, even with deviations, to the detailed requirements for the item in the said specifications. For each item of material, the specifications shall provide for either a minimum of three named brands of material or a description of material which can be met by a minimum of three manufacturers or producers, and for the equal of any one of said name or described materials.

(c) The term "lowest responsible and eligible bidder" shall mean the bidder: (1) whose bid is the lowest of those bidders possessing the skill, ability and integrity necessary for the faithful performance of the work; (2) who shall certify, that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work; (3) who shall certify that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; (4) who, where the provisions of section 8B of chapter 29 apply, shall have been determined to be qualified thereunder; and (5) who obtains within 10 days of the notification of contract award the security by bond required under section 29 of chapter 149; provided that for the purposes of this section the term "security by bond" shall mean the bond of a surety company qualified to do business under the laws of the commonwealth and satisfactory to the awarding authority; provided further, that if there is more than 1 surety company, the surety companies shall be jointly and severally liable.

(d) The provisions of this section shall not apply (1) to the extent that they prevent the approval of such specifications by any contributing federal agency, (2) to materials purchased under specifications of the state department of highways at prices established by the said department pursuant to advertisement and bidding in connection with work to be performed under the provisions of chapter eighty-one or chapter ninety, (3) to any transaction between the commonwealth and any of its political subdivisions or between the commonwealth and any public service

corporation, and (4) to any contract of not more than $50,000 awarded by a governmental body, as defined by section two of chapter thirty B, in accordance with the provisions of section five of said chapter thirty B; and (5) to any contract solely for the purchase of material awarded by a governmental body, as defined by section 2 of chapter 30B, in accordance with section 5 of said chapter 30B, or procured through the operational services division pursuant to sections 22 and 52 of chapter 7.

(e) The word "material" as used in this section shall mean and include any article, assembly, system, or any component part thereof.

Chapter 30: Section 39N Construction contracts; equitable adjustment in contract price for differing subsurface or latent physical conditions

Section 39N. Every contract subject to section forty-four A of chapter one hundred and forty-nine or subject to section thirty-nine M of chapter thirty shall contain the following paragraph in its entirety and an awarding authority may adopt reasonable rules or regulations in conformity with that paragraph concerning the filing, investigation and settlement of such claims:

If, during the progress of the work, the contractor or the awarding authority discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the contract documents either the contractor or the contracting authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a contractor, or upon its own initiative, the contracting authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the contract documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and contract documents and are of such a nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the contracting authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly.

Chapter 30: Section 39O Contracts for construction and materials; suspension, delay or interruption due to order of awarding authority; adjustment in contract price; written claim

Section 39*O*. Every contract subject to the provisions of section thirty-nine M of this chapter or subject to section forty-four A of chapter one hundred forty-nine shall contain the following provisions (a) and (b) in their entirety and, in the event a suspension, delay, interruption or failure to act of the awarding authority increases the cost of performance to any subcontractor, that subcontractor shall have the same rights against the general contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the general contractor against the awarding authority, but nothing in provisions (a) and (b) shall in any way change, modify or alter any other rights which the general contractor or the subcontractor may have against each other.

(a) The awarding authority may order the general contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the awarding authority; provided however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the awarding authority to act within the time specified in this contract, the awarding authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.

(b) The general contractor must submit the amount of a claim under provision (a) to the awarding authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and, except for costs due to a suspension order, the awarding authority shall not approve any costs in the claim incurred more than twenty days before the general contractor notified the awarding authority in writing of the act or failure to act involved in the claim.

Chapter 30: Section 39P Contracts for construction and materials; awarding authority's decisions on interpretation of specifications, etc.; time limit; notice

Section 39P. Every contract subject to section thirty-nine M of this chapter or section forty-four A of chapter one hundred forty-nine which requires the awarding authority, any official, its architect or engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, shall require that the decision be made promptly and, in any event, no later than thirty days after the written submission for decision; but if such decision requires extended investigation and study, the awarding authority, the official, architect or engineer shall, within thirty days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the thirty day period and the date by which the decision will be made.

Chapter 30: Section 39Q Contracts for capital facility construction; contents; annual claims report

Section 39Q. (1) Every contract awarded by any state agency as defined by section thirty-nine A of chapter seven for the construction, reconstruction, alteration, remodeling, repair or demolition of any capital facility as defined by the aforesaid section thirty-nine A shall contain the following subparagraphs (a) through (d) in their entirety:

(a) Disputes regarding changes in and interpretations of the terms or scope of the contract and denials of or failures to act upon claims for payment for extra work or materials shall be resolved according to the following procedures, which shall constitute the exclusive method for resolving such disputes. Written notice of the matter in dispute shall be submitted promptly by the claimant to the chief executive official of the state agency which awarded the contract or his designee. No person or business entity having a contract with a state agency shall delay, suspend, or curtail performance under that contract as a result of any dispute subject to this section. Any disputed order, decision or action by the agency or its authorized representative shall be fully performed or complied with pending resolution of the dispute.

(b) Within thirty days of submission of the dispute to the chief executive official of the state agency or his designee, he shall issue a written decision stating the reasons therefor, and shall notify the parties of their right of appeal under this section. If the official or his designee is unable to issue a decision within thirty days, he shall notify the parties to the dispute in writing of the reasons why a decision cannot be issued within thirty days and of the date by which the decision shall issue. Failure to issue a decision within the thirty-day period or within the additional time period specified in such written notice shall be deemed to constitute a denial of the claim and shall authorize resort to the appeal procedure described below. The decision of the chief executive official or his designee shall be final and conclusive unless an appeal is taken as provided below.

(c) Within twenty-one calendar days of the receipt of a written decision or of the failure to issue a decision as stated in the preceding subparagraph, any aggrieved party may file a notice of claim for an adjudicatory hearing with the division of hearing officers or the aggrieved party may file an action directly in a court of competent jurisdiction and shall serve copies thereof upon all other parties in the form and manner prescribed by the rules governing the conduct of adjudicatory proceedings of the division of hearing officers. In the event an aggrieved party exercises his option to file an action directly in court as provided in the previous sentence, the twenty-one day period shall not apply to such filing and the period of filing such action shall be the same period otherwise applicable for filing a civil action in superior court. The appeal shall be referred to a hearing officer experienced in construction law and shall be prosecuted in accordance with the formal rules of procedure for the conduct of adjudicatory hearings of the division of hearing officers, except as provided below. The hearing officer shall issue a final decision as expeditiously as possible, but in no event more than one hundred and twenty calendar days after conclusion of the adjudicatory hearing, unless the decision is delayed by a request for extension of time for filing post-hearing briefs or other submissions assented to by all parties. Whenever, because an extension of time has been granted, the hearing officer is unable to issue a decision within one hundred and twenty days, he shall notify all parties of the reasons for the delay and the date when the decision will issue. Failure to issue a decision within the one hundred and twenty-day period or within the additional period specified in such written notice shall give the petitioner the right to pursue any legal remedies available to him without further delay.

(d) When the amount in dispute is less than ten thousand dollars, a contractor who is party to the dispute may elect to submit the appeal to a hearing officer experienced in construction law for expedited hearing in accordance with the informal rules of practice and procedure of the division of hearing officers. An expedited hearing under this subparagraph shall be available at the sole option of the contractor. The hearing officer shall issue a decision no later than sixty days following the conclusion of any hearing conducted pursuant to this subparagraph. The hearing officer's decision shall be final and conclusive, and shall not be set aside except in cases of fraud.

(2) The commissioner of administration shall require the division of hearings officers to prepare annually a report concerning the construction contract claims submitted to the division during the preceding twelve months, in such form as the commissioner shall prescribe. The report shall contain, at a minimum, the following information: the number of claims submitted; the names of all parties to each such claim; a brief description of the claim; the date of submission and of disposition of the claim; its disposition, whether by settlement, withdrawal, default or written decision; and the number of claims currently pending. The original of the report shall be submitted to the commissioner of administration by January fifteenth, and a copy shall be filed with the state librarian and shall be a public document.

Chapter 30: Section 39R Definitions; contract provisions; management and financial statements; enforcement

Section 39R. (a) The words defined herein shall have the meaning stated below whenever they appear in this section:

(1) ""Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A to forty-four H, inclusive, of chapter one hundred and forty-nine, which is for an amount or estimated amount greater than one hundred thousand dollars.

(2) ""Contract" means any contract awarded or executed pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A through forty-four H, inclusive, of chapter one hundred and forty-nine, which is for amount or estimated amount greater than one hundred thousand dollars.

(3) ""Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

(4) ""Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.

(5) ""Audit", when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a *certified* opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.

(6) ""Accountant's Report", when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which he has made and sets forth his opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed the reason therefor shall be stated. An accountant's report shall include as a part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the audited financial statement is a true and complete statement of the financial condition of the contractor.

(7) ""Management", when used herein, means the chief executive officers, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the contractor.

(8) Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

(b) Subsection (a)(2) hereof notwithstanding, every agreement or contract awarded or executed pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven, or eleven C of chapter twenty-five A, and pursuant to section thirty-nine M of chapter thirty or to section forty-four A through H, inclusive, of chapter one hundred and forty-nine, shall provide that:

(1) The contractor shall make, and keep for at least six years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the contractor, and

(2) until the expiration of six years after final payment, the office of inspector general, and the commissioner of capital asset management and maintenance shall have the right to examine any books, documents, papers or records of the contractor or of his subcontractors that directly pertain to, and involve transactions relating to, the contractor or his subcontractors, and

(3) if the agreement is a contract as defined herein, the contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the awarding authority, including in his description the date of the change and reasons therefor, and shall accompany said description with a letter from the contractor's independent certified public accountant approving or otherwise commenting on the changes, and

(4) if the agreement is a contract as defined herein, the contractor has filed a statement of management on internal accounting controls as set forth in paragraph (c) below prior to the execution of the contract, and

(5) if the agreement is a contract as defined herein, the contractor has filed prior to the execution of the contracts and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in paragraph (d) below.

(c) Every contractor awarded a contract shall file with the awarding authority a statement of management as to whether the system of internal accounting controls of the contractor and its subsidiaries reasonably assures that:

(1) transactions are executed in accordance with management's general and specific authorization;

(2) transactions are recorded as necessary

i. to permit preparation of financial statements in conformity with generally accepted accounting principles, and

ii. to maintain accountability for assets;

(3) access to assets is permitted only in accordance with management's general or specific authorization; and

(4) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

Every contractor awarded a contract shall also file with the awarding authority a statement prepared and signed by an independent certified public accountant, stating that he has examined the statement of management on internal accounting controls, and expressing an opinion as to

(1) whether the representations of management in response to this paragraph and paragraph (b) above are consistent with the result of management's evaluation of the system of internal accounting controls; and

(2) whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.

(d) Every contractor awarded a contract by the commonwealth or by any political subdivision thereof shall annually file with the commissioner of capital asset management and maintenance during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountant's report. Such statements shall be made available to the awarding authority upon request.

(e) The office of inspector general, the commissioner of capital asset management and maintenance and any other awarding authority shall enforce the provisions of this section. The commissioner of capital asset management and maintenance may after providing an opportunity for the inspector general and other interested parties to comment, promulgate pursuant to the provisions of chapter thirty A such rules, regulations and guidelines as are necessary to effectuate the purposes of this section. Such rules, regulations and guidelines may be applicable to all awarding authorities. A contractor's failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to section forty-four C of chapter one hundred and forty-nine.

(f) Records and statements required to be made, kept or filed under the provisions of this section shall not be public records as defined in section seven of chapter four and shall not be open to public inspection; provided, however, that such records and statements shall be made available pursuant to the provisions of clause (2) of paragraph (b).

CHAPTER 82. THE LAYING OUT, ALTERATION, RELOCATION AND DISCONTINUANCE OF PUBLIC WAYS, AND SPECIFIC REPAIRS THEREON

Chapter 82: Section 40 Definitions

Section 40. The following words, as used in this section and sections 40A to 40E, inclusive, shall have the following meanings:--

""Company", natural gas pipeline company, petroleum or petroleum products pipeline company, public utility company, cable television company, and municipal utility company or department that supply gas, electricity, telephone, communication or cable television services or private water companies within the city or town where such excavation is to be made.

""Description of excavation location", such description shall include the name of the city or town, street, way, or route number where appropriate, the name of the streets at the nearest intersection to the excavation, the number of the buildings closest to the excavation or any other description, including landmarks, utility pole numbers or other information which will accurately define the location of the excavation.

""Emergency", a condition in which the safety of the public is in imminent danger, such as a threat to life or health or where immediate correction is required to maintain or restore essential public utility service.

""Excavation", an operation for the purpose of movement or removal of earth, rock or the materials in the ground including, but not limited to, digging, blasting, augering, backfilling, test boring, drilling, pile driving, grading, plowing in, hammering, pulling in, jacking in, trenching, tunneling and demolition of structures, excluding excavation by tools manipulated only by human power for gardening purposes and use of blasting for quarrying purposes.

""Excavator", any entity including, but not limited to, a person, partnership, joint venture, trust, corporation, association, public utility, company or state or local government body which performs excavation operations.

""Premark", to delineate the general scope of the excavation or boring on the paved surface of the ground using white paint, or stakes or other suitable white markings on nonpaved surfaces. No premarking shall be acceptable if such marks can reasonably interfere with traffic or pedestrian control or are misleading to the general public. Premarking shall not be required of any continuous excavation that is over 500 feet in length.

""Safety zone", a zone designated on the surface by the use of standard color-coded markings which contains the width of the facilities plus not more than 18 inches on each side.

""Standard color-coded markings", red - electric power lines, cables, conduit or light cables; yellow - gas, oil, street petroleum, or other gaseous materials; orange - communications cables or conduit, alarm or signal lines; blue - water, irrigation and slurry lines; green - sewer and drain lines; white - premark of proposed excavation.

""System", the underground plant damage prevention system as defined in section 76D of chapter 164

Chapter 82: Section 40A Excavations; notice

Section 40A. No excavator installing a new facility or an addition to an existing facility or the relay or repair of an existing facility shall, except in an emergency, make an excavation, in any public or private way, any company right-of-way or easement or any public or privately owned land or way, unless at least 72 hours, exclusive of Saturdays, Sundays and legal holidays but not more than 30 days before the proposed excavation is to be made, such excavator has premarked not more than 500 feet of the proposed excavation and given an initial notice to the system. Such

initial notice shall set forth a description of the excavation location in the manner as herein defined. In addition, such initial notice shall indicate whether any such excavation will involve blasting and, if so, the date and the location at which such blasting is to occur.

The notice requirements shall be waived in an emergency as defined herein; provided, however, that before such excavation begins or during a life-threatening emergency, notification shall be given to the system and the initial point of boring or excavation shall be premarked. The excavator shall ensure that the underground facilities of the utilities in the area of such excavation shall not be damaged or jeopardized.

In no event shall any excavation by blasting take place unless notice thereof, either in the initial notice or a subsequent notice accurately specifying the date and location of such blasting shall have been given and received at least 72 hours in advance, except in the case of an unanticipated obstruction requiring blasting when such notice shall be not less than four hours prior to such blasting. If any such notice cannot be given as aforesaid because of an emergency requiring blasting, it shall be given as soon as may be practicable but before any explosives are discharged.

Chapter 82: Section 40B Designation of location of underground facilities

Section 40B. Within 72 hours, exclusive of Saturdays, Sundays and legal holidays, from the time the initial notice is received by the system or at such time as the company and the excavator agree, such company shall respond to the initial notice or subsequent notice by designating the location of the underground facilities within 15 feet in any direction of the premarking so that the existing facilities are to be found within a safety zone. Such safety zone shall be so designated by the use of standard color-coded markings. The providing of such designation by the company shall constitute prima facie evidence of an exercise of reasonable precaution by the company as required by this section; provided, however, that in the event that the excavator has given notice as aforesaid at a location at which because of the length of excavation the company cannot reasonably designate the entire location of its facilities within such 72 hour period, then such excavator shall identify for the company that portion of the excavation which is to be first made and the company shall designate the location of its facilities in such portion within 72 hours and shall designate the location of its facilities in the remaining portion of the location within a reasonable time thereafter. When an emergency notification has been given to the system, the company shall make every attempt to designate its facilities as promptly as possible.

Chapter 82: Section 40C Excavator's responsibility to maintain designation markings; damage caused by excavator

Section 40C. After a company has designated the location of its facilities at the location in accordance with section 40B, the excavator shall be responsible for maintaining the designation markings at such locations, unless such excavator requests remarking at the location due to the obliteration, destruction or other removal of such markings. The company shall then remark such location within 24 hours following receipt of such request.

When excavating in close proximity to the underground facilities of any company when such facilities are to be exposed, non-mechanical means shall be employed, as necessary, to avoid damage in locating such facility and any further excavation shall be performed employing reasonable precautions to avoid damage to any underground facilities including, but not limited to, any substantial weakening of structural or lateral support of such facilities, penetration or destruction of any pipe, main, wire or conduit or the protective coating thereof, or damage to any pipe, main, wire or conduit.

If any damage to such pipe, main, wire or conduit or its protective coating occurs, the company shall be notified immediately by the excavator responsible for causing such damage.

The making of an excavation without providing the notice required by section 40A with respect to any proposed excavation which results in any damage to a pipe, main, wire or conduit, or its protective coating, shall be prima facie evidence in any legal or administrative proceeding that such damage was caused by the negligence of such person.

Chapter 82: Section 40D Local laws requiring excavation permits; public ways

Section 40D. Nothing in this section shall affect or impair local ordinances or by-laws requiring a permit to be obtained before excavation in a public way or on private property; but notwithstanding any general or special law, ordinance or by-law to the contrary, to the extent that any permit issued under the provisions of the state building code or state fire code requires excavation by an excavator on a public way or on private property, the permit shall not be valid unless the excavator notifies the system as required pursuant to sections 40 and 40A, before the commencement of the excavation, and has complied with the permitting requirements of chapter 82A.

Chapter 82: Section 40E Violations of secs. 40A -- 40E; punishment

Section 40E. Any person or company found by the department of telecommunications and energy, after a hearing, to have violated any provision of sections 40A to 40E, inclusive, shall be fined $500 for the first offense and not less than $1,000 nor more than $5,000 for any subsequent offense within 12 consecutive months as set forth by the rules of said department; provided, however, that nothing herein shall be construed to require forfeiture of any penal sum by a state or local government body for violation of section 40A or 40C; and provided, further, that nothing herein shall be construed to require the forfeiture of any penal sum by a residential property owner for the failure to premark for an excavation on such person's residential property.

GENERAL LAWS OF MASSACHUSETTS

Chapter 149: Section 34 Public contracts; stipulation as to hours and days of work; void contracts

Section 34. Every contract, except for the purchase of material or supplies, involving the employment of laborers, workmen, mechanics, foremen or inspectors, to which the commonwealth or any county or any town, subject to section thirty, is a party, shall contain a stipulation that no laborer, workman, mechanic, foreman or inspector working within the commonwealth, in the employ of the contractor, sub-contractor or other person doing or contracting to do the whole or a part of the work contemplated by the contract, shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more than six days in any one week, except in cases of emergency, or, in case any town subject to section thirty-one is a party to such a contract, more than eight hours in any one day, except as aforesaid; provided, that in contracts entered into by the department of highways for the construction or reconstruction of highways there may be inserted in said stipulation a provision that said department, or any contractor or sub-contractor for said department, may employ laborers, workmen, mechanics, foremen and inspectors for more than eight hours in any one day in such construction or reconstruction when, in the opinion of the commissioner of labor and industries, public necessity so requires. Every such contract not containing the aforesaid stipulation shall be null and void.

Chapter 149: Section 44J Invitations to bid; notice; contents; violations; penalty

Section 44J. (1) No public agency or authority of the commonwealth or any political subdivision thereof shall award any contract for which competitive bids are required pursuant to section forty-four A of this chapter or section thirty-nine M of chapter thirty, or for which competitive proposals are required pursuant to subsection (4) of section forty-four E of this chapter or section eleven C of chapter twenty-five A, unless a notice inviting bids or proposals therefor shall have been posted no less than one week prior to the time specified in such notice for the receipt of said bids or proposals in a conspicuous place in or near the offices of the awarding authority, and shall have remained posted until the time so specified, and unless such notice shall also have been published at least once not less than two weeks prior to the time so specified in the central register published by the secretary of state pursuant to section twenty A of chapter nine and in a newspaper of general circulation in the locality of the proposed project. Said notice shall also be published at such other times and in such other newspapers or trade periodicals as the commissioner of capital asset management and maintenance may require, having regard to the locality of the work involved.

(2) Said notice shall specify the time and place where plans and specifications of the proposed work may be had; the time and place of submission of general bids; and the time and place for opening of the general bids. For contracts subject to the provisions of sections forty-four A to H, inclusive, of this chapter, said notice shall also specify the time and place for submission of filed sub-bids, where required pursuant to section forty-four F; and the time and place for opening of said filed sub-bids.

Said notice shall also provide sufficient facts concerning the nature and scope of such project, the type and elements of construction, and such other information as will assist applicants in deciding to bid on such contract.

(3) No contract or preliminary plans and specifications shall be split or divided for the purpose of evading the provisions of this section.

(4) General bids and filed sub-bids for any contract subject to this section shall be in writing and shall be opened in public at the time and place specified in the posted or published notice, and after being so opened shall be open to public inspection.

(5) The provisions of this section shall not apply to any transaction between the commonwealth and any public service corporation.

(6) The provisions of this section may be waived in cases of extreme emergency involving the health and safety of the people and their property, upon the written approval of said commissioner. The written approval shall contain a description of the circumstances and the reasons for the commissioner's determination.

(7) Whoever violates any provision of this section shall be punished by a fine of not more than ten thousand dollars or by imprisonment in the state prison for not more than three years or in a jail or house of correction for not more than two and one-half years, or by both said fine and imprisonment; and in the event of final conviction, said person shall be incapable of holding any office of honor, trust or profit under the commonwealth or under any county, district of municipal agency.

Each and every person who shall cause or conspire to cause any contract or preliminary plans and specifications to be split or divided for the purpose of evading the provisions of this section shall forfeit and pay to the commonwealth, a political subdivision thereof or other awarding authority subject to this section, the sum of not more than five thousand dollars and, in addition, such person or persons shall pay, apportioned among them, double the amount of damages which the commonwealth or political subdivision thereof or other awarding authority may have sustained by reason of the doing of such act, together with the costs of the action.

(8) If an awarding authority rejects all general bids or does not receive any general bids, and advertises for a second opening of general bids with the original filed sub-bids as set forth in subsection (1) of section forty-four E the notice for receipt of such general bids may be published in the central register and elsewhere as required not less than one week prior to the time specified for such second opening of general bids.

WAGE DETERMINATION SCHEDULE

Commonwealth of Massachusetts - Executive Office of Labor and workforce Development
Department of Labor Standards

Prevailing Wages – Project Rates

MAURA HEALEY
Governor

KIM DRISCOLL
Lt. Governor

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

LAUREN JONES
Secretary

MICHAEL FLANAGAN
Director

Awarding Authority: Town of Ayer

Contract Number:

City/Town: AYER

Description of Work: Project consist of CCTV, sewer pipeline rehabilitation including cured0in-place pipe lining, cured-in-place lateral lining, and manhole rehabilitation

Job Location: Sandy Pond Road, Ayer, MA 01432

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- **The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor.** For multi-year CM AT RISK projects, the awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. The annual update requirement is not applicable to 27F "rental of equipment" contracts. **The updated wage schedule must be provided to all contractors, including general and sub-contractors, working on the construction project.**
- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or a sub-contractor.
- Apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS). Apprentices must keep their apprentice identification card on their persons during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DAS regardless of whether they are registered with another federal, state, local, or private agency must be paid the journeyworker's rate.**
- Every contractor or subcontractor working on the construction project must submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. For a sample payroll reporting form go to http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Contractors must obtain the wage schedules from awarding authorities. Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may file a complaint with the Fair Labor Division of the office of the Attorney General at (617) 727-3465.

Issue Date: 06/07/2023 **Wage Request Number:** 20230607-033

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$35.95	$13.41	$16.01	$0.00	$65.37
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.02	$13.41	$16.01	$0.00	$65.44
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.14	$13.41	$16.01	$0.00	$65.56
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 2)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR *LABORERS - ZONE 2*	06/01/2023	$38.21	$9.40	$16.89	$0.00	$64.50
	12/01/2023	$39.11	$9.40	$16.89	$0.00	$65.40
For apprentice rates see "Apprentice- LABORER"						
AIR TRACK OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	06/01/2023	$38.21	$9.40	$16.89	$0.00	$64.50
	12/01/2023	$39.11	$9.40	$16.89	$0.00	$65.40
	06/01/2024	$40.44	$9.40	$16.89	$0.00	$66.73
	12/01/2024	$41.77	$9.40	$16.89	$0.00	$68.06
	06/01/2025	$43.16	$9.40	$16.89	$0.00	$69.45
	12/01/2025	$44.54	$9.40	$16.89	$0.00	$70.83
	06/01/2026	$45.98	$9.40	$16.89	$0.00	$72.27
	12/01/2026	$47.42	$9.40	$16.89	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	12/01/2020	$38.10	$12.80	$9.45	$0.00	$60.35
ASPHALT RAKER *LABORERS - ZONE 2*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
	06/01/2024	$39.94	$9.40	$16.89	$0.00	$66.23
	12/01/2024	$41.27	$9.40	$16.89	$0.00	$67.56
	06/01/2025	$42.66	$9.40	$16.89	$0.00	$68.95
	12/01/2025	$44.04	$9.40	$16.89	$0.00	$70.33
	06/01/2026	$45.48	$9.40	$16.89	$0.00	$71.77
	12/01/2026	$46.92	$9.40	$16.89	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.88	$14.25	$16.05	$0.00	$85.18
	12/01/2023	$56.13	$14.25	$16.05	$0.00	$86.43
	06/01/2024	$57.43	$14.25	$16.05	$0.00	$87.73
	12/01/2024	$58.88	$14.25	$16.05	$0.00	$89.18
	06/01/2025	$60.18	$14.25	$16.05	$0.00	$90.48
	12/01/2025	$61.63	$14.25	$16.05	$0.00	$91.93
	06/01/2026	$62.93	$14.25	$16.05	$0.00	$93.23
	12/01/2026	$64.38	$14.25	$16.05	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BACKHOE/FRONT-END LOADER *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.88	$14.25	$16.05	$0.00	$85.18
	12/01/2023	$56.13	$14.25	$16.05	$0.00	$86.43
	06/01/2024	$57.43	$14.25	$16.05	$0.00	$87.73
	12/01/2024	$58.88	$14.25	$16.05	$0.00	$89.18
	06/01/2025	$60.18	$14.25	$16.05	$0.00	$90.48
	12/01/2025	$61.63	$14.25	$16.05	$0.00	$91.93
	06/01/2026	$62.93	$14.25	$16.05	$0.00	$93.23
	12/01/2026	$64.38	$14.25	$16.05	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 2*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 2*	06/01/2023	$38.21	$9.40	$16.89	$0.00	$64.50
	12/01/2023	$39.11	$9.40	$16.89	$0.00	$65.40
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	06/01/2023	$38.21	$9.40	$16.89	$0.00	$64.50
	12/01/2023	$39.11	$9.40	$16.89	$0.00	$65.40
	06/01/2024	$40.44	$9.40	$16.89	$0.00	$66.73
	12/01/2024	$41.77	$9.40	$16.89	$0.00	$68.06
	06/01/2025	$43.16	$9.40	$16.89	$0.00	$69.45
	12/01/2025	$44.54	$9.40	$16.89	$0.00	$70.83
	06/01/2026	$45.98	$9.40	$16.89	$0.00	$72.27
	12/01/2026	$47.42	$9.40	$16.89	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2023	$47.37	$7.07	$20.31	$0.00	$74.75
	01/01/2024	$48.12	$7.07	$20.60	$0.00	$75.79

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$30.79	$7.07	$13.22	$0.00	$51.08
2	65	$30.79	$7.07	$13.22	$0.00	$51.08
3	70	$33.16	$7.07	$14.23	$0.00	$54.46
4	75	$35.53	$7.07	$15.24	$0.00	$57.84
5	80	$37.90	$7.07	$16.25	$0.00	$61.22
6	85	$40.26	$7.07	$17.28	$0.00	$64.61
7	90	$42.63	$7.07	$18.28	$0.00	$67.98
8	95	$45.00	$7.07	$19.32	$0.00	$71.39

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$31.28	$7.07	$13.22	$0.00	$51.57
2	65	$31.28	$7.07	$13.22	$0.00	$51.57
3	70	$33.68	$7.07	$14.23	$0.00	$54.98
4	75	$36.09	$7.07	$15.24	$0.00	$58.40
5	80	$38.50	$7.07	$16.25	$0.00	$61.82
6	85	$40.90	$7.07	$17.28	$0.00	$65.25
7	90	$43.31	$7.07	$18.28	$0.00	$68.66
8	95	$45.71	$7.07	$19.32	$0.00	$72.10

Notes:

Apprentice to Journeyworker Ratio:1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (LOWELL)*	02/01/2023	$58.21	$11.49	$21.65	$0.00	$91.35
	08/01/2023	$60.26	$11.49	$21.65	$0.00	$93.40
	02/01/2024	$61.51	$11.49	$21.65	$0.00	$94.65
	08/01/2024	$63.61	$11.49	$21.65	$0.00	$96.75
	02/01/2025	$64.91	$11.49	$21.65	$0.00	$98.05
	08/01/2025	$67.06	$11.49	$21.65	$0.00	$100.20
	02/01/2026	$68.41	$11.49	$21.65	$0.00	$101.55
	08/01/2026	$70.61	$11.49	$21.65	$0.00	$103.75
	02/01/2027	$72.01	$11.49	$21.65	$0.00	$105.15

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 Lowell*

Effective Date - 02/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$29.11	$11.49	$21.65	$0.00	$62.25
2	60	$34.93	$11.49	$21.65	$0.00	$68.07
3	70	$40.75	$11.49	$21.65	$0.00	$73.89
4	80	$46.57	$11.49	$21.65	$0.00	$79.71
5	90	$52.39	$11.49	$21.65	$0.00	$85.53

Effective Date - 08/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$30.13	$11.49	$21.65	$0.00	$63.27
2	60	$36.16	$11.49	$21.65	$0.00	$69.30
3	70	$42.18	$11.49	$21.65	$0.00	$75.32
4	80	$48.21	$11.49	$21.65	$0.00	$81.35
5	90	$54.23	$11.49	$21.65	$0.00	$87.37

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	06/01/2023	$44.73	$9.40	$17.97	$0.00	$72.10
	12/01/2023	$45.98	$9.40	$17.97	$0.00	$73.35
	06/01/2024	$47.46	$9.40	$17.97	$0.00	$74.83
	12/01/2024	$48.93	$9.40	$17.97	$0.00	$76.30
	06/01/2025	$50.43	$9.40	$17.97	$0.00	$77.80
	12/01/2025	$51.93	$9.40	$17.97	$0.00	$79.30
	06/01/2026	$53.48	$9.40	$17.97	$0.00	$80.85
	12/01/2026	$54.98	$9.40	$17.97	$0.00	$82.35

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2023	$43.58	$9.40	$17.97	$0.00	$70.95
	12/01/2023	$44.83	$9.40	$17.97	$0.00	$72.20
	06/01/2024	$46.31	$9.40	$17.97	$0.00	$73.68
	12/01/2024	$47.78	$9.40	$17.97	$0.00	$75.15
	06/01/2025	$49.28	$9.40	$17.97	$0.00	$76.65
	12/01/2025	$50.78	$9.40	$17.97	$0.00	$78.15
	06/01/2026	$52.33	$9.40	$17.97	$0.00	$79.70
	12/01/2026	$53.83	$9.40	$17.97	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	06/01/2023	$43.58	$9.40	$17.97	$0.00	$70.95
	12/01/2023	$44.83	$9.40	$17.97	$0.00	$72.20
	06/01/2024	$46.31	$9.40	$17.97	$0.00	$73.68
	12/01/2024	$47.78	$9.40	$17.97	$0.00	$75.15
	06/01/2025	$49.28	$9.40	$17.97	$0.00	$76.65
	12/01/2025	$50.78	$9.40	$17.97	$0.00	$78.15
	06/01/2026	$52.33	$9.40	$17.97	$0.00	$79.70
	12/01/2026	$53.83	$9.40	$17.97	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 2*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS -ZONE 2 (Eastern Massachusetts)*	03/01/2023	$45.12	$9.33	$19.97	$0.00	$74.42

Apprentice - *CARPENTER - Zone 2 Eastern MA*

Effective Date - 03/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.56	$9.33	$1.73	$0.00	$33.62
2	60	$27.07	$9.33	$1.73	$0.00	$38.13
3	70	$31.58	$9.33	$14.78	$0.00	$55.69
4	75	$33.84	$9.33	$14.78	$0.00	$57.95
5	80	$36.10	$9.33	$16.51	$0.00	$61.94
6	80	$36.10	$9.33	$16.51	$0.00	$61.94
7	90	$40.61	$9.33	$18.24	$0.00	$68.18
8	90	$40.61	$9.33	$18.24	$0.00	$68.18

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $30.71/ 3&4 $36.93/ 5&6 $56.82/ 7&8 $63.06

Apprentice to Journeyworker Ratio:1:5

CARPENTER WOOD FRAME *CARPENTERS-ZONE 3 (Wood Frame)*	04/01/2023	$24.16	$7.21	$4.80	$0.00	$36.17
All Aspects of New Wood Frame Work						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER (Wood Frame) - Zone 3*

Effective Date - 04/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$14.50	$7.21	$0.00	$0.00	$21.71
2	60	$14.50	$7.21	$0.00	$0.00	$21.71
3	65	$15.70	$7.21	$0.00	$0.00	$22.91
4	70	$16.91	$7.21	$0.00	$0.00	$24.12
5	75	$18.12	$7.21	$3.80	$0.00	$29.13
6	80	$19.33	$7.21	$3.80	$0.00	$30.34
7	85	$20.54	$7.21	$3.80	$0.00	$31.55
8	90	$21.74	$7.21	$3.80	$0.00	$32.75

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $17.86/ 3&4 $20.22/ 5&6 $27.57/ 7&8 $29.94

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (LOWELL)*	01/01/2023	$49.45	$12.75	$22.74	$0.87	$85.81
	07/01/2023	$50.59	$12.75	$22.74	$0.87	$86.95
	01/01/2024	$51.73	$12.75	$22.74	$0.87	$88.09

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CEMENT MASONRY/PLASTERING - Lowell*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.73	$12.75	$15.49	$0.00	$52.97
2	60	$29.67	$12.75	$22.74	$0.62	$65.78
3	65	$32.14	$12.75	$22.74	$0.62	$68.25
4	70	$34.62	$12.75	$22.74	$0.62	$70.73
5	75	$37.09	$12.75	$22.74	$0.62	$73.20
6	80	$39.56	$12.75	$22.74	$0.62	$75.67
7	90	$44.51	$12.75	$22.74	$0.62	$80.62

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.30	$12.75	$15.49	$0.00	$53.54
2	60	$30.35	$12.75	$22.74	$0.62	$66.46
3	65	$32.88	$12.75	$22.74	$0.62	$68.99
4	70	$35.41	$12.75	$22.74	$0.62	$71.52
5	75	$37.94	$12.75	$22.74	$0.62	$74.05
6	80	$40.47	$12.75	$22.74	$0.62	$76.58
7	90	$45.53	$12.75	$22.74	$0.62	$81.64

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR *LABORERS - ZONE 2*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$55.95	$14.25	$16.05	$0.00	$86.25
	12/01/2023	$57.23	$14.25	$16.05	$0.00	$87.53
	06/01/2024	$58.55	$14.25	$16.05	$0.00	$88.85
	12/01/2024	$60.03	$14.25	$16.05	$0.00	$90.33
	06/01/2025	$61.36	$14.25	$16.05	$0.00	$91.66
	12/01/2025	$62.83	$14.25	$16.05	$0.00	$93.13
	06/01/2026	$64.16	$14.25	$16.05	$0.00	$94.46
	12/01/2026	$65.64	$14.25	$16.05	$0.00	$95.94
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$35.90	$14.25	$16.05	$0.00	$66.20
	12/01/2023	$36.72	$14.25	$16.05	$0.00	$67.02
	06/01/2024	$37.57	$14.25	$16.05	$0.00	$67.87
	12/01/2024	$38.52	$14.25	$16.05	$0.00	$68.82
	06/01/2025	$39.37	$14.25	$16.05	$0.00	$69.67
	12/01/2025	$40.32	$14.25	$16.05	$0.00	$70.62
	06/01/2026	$41.18	$14.25	$16.05	$0.00	$71.48
	12/01/2026	$42.13	$14.25	$16.05	$0.00	$72.43

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2023	$56.06	$8.65	$23.05	$0.00	$87.76
	07/01/2023	$57.26	$8.65	$23.05	$0.00	$88.96
	01/01/2024	$58.46	$8.65	$23.05	$0.00	$90.16
	07/01/2024	$59.66	$8.65	$23.05	$0.00	$91.36
	01/01/2025	$60.86	$8.65	$23.05	$0.00	$92.56

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.03	$8.65	$0.00	$0.00	$36.68
2	55	$30.83	$8.65	$6.27	$0.00	$45.75
3	60	$33.64	$8.65	$6.84	$0.00	$49.13
4	65	$36.44	$8.65	$7.41	$0.00	$52.50
5	70	$39.24	$8.65	$19.63	$0.00	$67.52
6	75	$42.05	$8.65	$20.20	$0.00	$70.90
7	80	$44.85	$8.65	$20.77	$0.00	$74.27
8	90	$50.45	$8.65	$21.91	$0.00	$81.01

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.63	$8.65	$0.00	$0.00	$37.28
2	55	$31.49	$8.65	$6.27	$0.00	$46.41
3	60	$34.36	$8.65	$6.84	$0.00	$49.85
4	65	$37.22	$8.65	$7.41	$0.00	$53.28
5	70	$40.08	$8.65	$19.63	$0.00	$68.36
6	75	$42.95	$8.65	$20.20	$0.00	$71.80
7	80	$45.81	$8.65	$20.77	$0.00	$75.23
8	90	$51.53	$8.65	$21.91	$0.00	$82.09

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN *LABORERS - ZONE 2*	06/01/2023	$43.73	$9.40	$17.82	$0.00	$70.95
	12/01/2023	$44.98	$9.40	$17.82	$0.00	$72.20
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 2*	06/01/2023	$44.73	$9.40	$17.82	$0.00	$71.95
	12/01/2023	$45.98	$9.40	$17.82	$0.00	$73.20
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS *LABORERS - ZONE 2*	06/01/2023	$44.48	$9.40	$17.82	$0.00	$71.70
	12/01/2023	$45.73	$9.40	$17.82	$0.00	$72.95
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 2*	06/01/2023	$44.73	$9.40	$17.82	$0.00	$71.95
	12/01/2023	$45.98	$9.40	$17.82	$0.00	$73.20
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 2*	06/01/2023	$44.48	$9.40	$17.82	$0.00	$71.70
	12/01/2023	$45.73	$9.40	$17.82	$0.00	$72.95
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER *LABORERS - ZONE 2*	06/01/2023	$43.73	$9.40	$17.82	$0.00	$70.95
	12/01/2023	$44.98	$9.40	$17.82	$0.00	$72.20
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 2)*	08/01/2020	$68.70	$9.40	$23.12	$0.00	$101.22
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 2)*	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 2)*	08/01/2020	$73.60	$9.40	$23.12	$0.00	$106.12
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 2)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) *DRAWBRIDGE - SEIU LOCAL 888*	07/01/2020	$26.77	$6.67	$3.93	$0.16	$37.53
ELECTRICIAN *ELECTRICIANS LOCAL 96*	09/04/2022	$45.59	$12.20	$17.50	$0.00	$75.29

Apprentice - *ELECTRICIAN - Local 96*

Effective Date - 09/04/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$18.24	$12.20	$0.55	$0.00	$30.99
2	43	$19.60	$12.20	$0.59	$0.00	$32.39
3	48	$21.88	$12.20	$14.18	$0.00	$48.26
4	55	$25.07	$12.20	$14.63	$0.00	$51.90
5	65	$29.63	$12.20	$15.27	$0.00	$57.10
6	80	$36.47	$12.20	$16.22	$0.00	$64.89

Notes:

Steps 1-2 are 1000 hrs; Steps 3-6 are 1500 hrs.

Apprentice to Journeyworker Ratio:2:3***

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 41*	01/01/2023	$61.13	$16.08	$20.56	$0.00	$97.77
	01/01/2024	$61.98	$16.18	$20.96	$0.00	$99.12
	01/01/2025	$62.83	$16.28	$21.36	$0.00	$100.47
	01/01/2026	$63.68	$16.38	$21.76	$0.00	$101.82
	01/01/2027	$64.53	$16.48	$22.16	$0.00	$103.17

Apprentice - *ELEVATOR CONSTRUCTOR - Local 41*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$30.57	$16.08	$0.00	$0.00	$46.65
2	55	$33.62	$16.08	$20.56	$0.00	$70.26
3	65	$39.73	$16.08	$20.56	$0.00	$76.37
4	70	$42.79	$16.08	$20.56	$0.00	$79.43
5	80	$48.90	$16.08	$20.56	$0.00	$85.54

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$30.99	$16.18	$0.00	$0.00	$47.17
2	55	$34.09	$16.18	$20.96	$0.00	$71.23
3	65	$40.29	$16.18	$20.96	$0.00	$77.43
4	70	$43.39	$16.18	$20.96	$0.00	$80.53
5	80	$49.58	$16.18	$20.96	$0.00	$86.72

Notes:

Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 41*	01/01/2023	$42.79	$16.08	$20.56	$0.00	$79.43
	01/01/2024	$43.39	$16.18	$20.96	$0.00	$80.53
	01/01/2025	$43.98	$16.28	$21.36	$0.00	$81.62
	01/01/2026	$44.58	$16.38	$21.76	$0.00	$82.72
	01/01/2027	$45.17	$16.48	$22.16	$0.00	$83.81

For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
	06/01/2024	$39.94	$9.40	$16.89	$0.00	$66.23
	12/01/2024	$41.27	$9.40	$16.89	$0.00	$67.56
	06/01/2025	$42.66	$9.40	$16.89	$0.00	$68.95
	12/01/2025	$44.04	$9.40	$16.89	$0.00	$70.33
	06/01/2026	$45.48	$9.40	$16.89	$0.00	$71.77
	12/01/2026	$46.92	$9.40	$16.89	$0.00	$73.21

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2023	$49.91	$14.25	$16.05	$0.00	$80.21
	11/01/2023	$51.15	$14.25	$16.05	$0.00	$81.45
	05/01/2024	$52.39	$14.25	$16.05	$0.00	$82.69
	11/01/2024	$53.68	$14.25	$16.05	$0.00	$83.98
	05/01/2025	$55.12	$14.25	$16.05	$0.00	$85.42
	11/01/2025	$56.41	$14.25	$16.05	$0.00	$86.71
	05/01/2026	$57.85	$14.25	$16.05	$0.00	$88.15
	11/01/2026	$59.14	$14.25	$16.05	$0.00	$89.44
	05/01/2027	$60.57	$14.25	$16.05	$0.00	$90.87
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2023	$51.47	$14.25	$16.05	$0.00	$81.77
	11/01/2023	$52.72	$14.25	$16.05	$0.00	$83.02
	05/01/2024	$53.97	$14.25	$16.05	$0.00	$84.27
	11/01/2024	$55.27	$14.25	$16.05	$0.00	$85.57
	05/01/2025	$56.72	$14.25	$16.05	$0.00	$87.02
	11/01/2025	$58.02	$14.25	$16.05	$0.00	$88.32
	05/01/2026	$59.47	$14.25	$16.05	$0.00	$89.77
	11/01/2026	$60.77	$14.25	$16.05	$0.00	$91.07
	05/01/2027	$62.22	$14.25	$16.05	$0.00	$92.52
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2023	$25.05	$14.25	$16.05	$0.00	$55.35
	11/01/2023	$25.78	$14.25	$16.05	$0.00	$56.08
	05/01/2024	$26.51	$14.25	$16.05	$0.00	$56.81
	11/01/2024	$27.27	$14.25	$16.05	$0.00	$57.57
	05/01/2025	$28.12	$14.25	$16.05	$0.00	$58.42
	11/01/2025	$28.88	$14.25	$16.05	$0.00	$59.18
	05/01/2026	$29.73	$14.25	$16.05	$0.00	$60.03
	11/01/2026	$30.49	$14.25	$16.05	$0.00	$60.79
	05/01/2027	$31.34	$14.25	$16.05	$0.00	$61.64
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 96*	09/04/2022	$45.59	$12.20	$17.50	$0.00	$75.29
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINT/COMMISSIONING *ELECTRICIANS LOCAL 96*	09/04/2022	$45.59	$12.20	$17.50	$0.00	$75.29
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIREMAN (ASST. ENGINEER) *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$44.56	$14.25	$16.05	$0.00	$74.86
	12/01/2023	$45.57	$14.25	$16.05	$0.00	$75.87
	06/01/2024	$46.63	$14.25	$16.05	$0.00	$76.93
	12/01/2024	$47.81	$14.25	$16.05	$0.00	$78.11
	06/01/2025	$48.87	$14.25	$16.05	$0.00	$79.17
	12/01/2025	$50.04	$14.25	$16.05	$0.00	$80.34
	06/01/2026	$51.10	$14.25	$16.05	$0.00	$81.40
	12/01/2026	$52.28	$14.25	$16.05	$0.00	$82.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FLAGGER & SIGNALER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	06/01/2023	$25.98	$9.40	$16.89	$0.00	$52.27
	12/01/2023	$25.98	$9.40	$16.89	$0.00	$52.27
	06/01/2024	$27.01	$9.40	$16.89	$0.00	$53.30
	12/01/2024	$27.01	$9.40	$16.89	$0.00	$53.30
	06/01/2025	$28.09	$9.40	$16.89	$0.00	$54.38
	12/01/2025	$28.09	$9.40	$16.89	$0.00	$54.38
	06/01/2026	$29.21	$9.40	$16.89	$0.00	$55.50
	12/01/2026	$29.21	$9.40	$16.89	$0.00	$55.50
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE I*	03/01/2022	$51.77	$9.33	$20.27	$0.00	$81.37

Apprentice - *FLOORCOVERER - Local 2168 Zone I*

Effective Date - 03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.89	$9.33	$1.79	$0.00	$37.01
2	55	$28.47	$9.33	$1.79	$0.00	$39.59
3	60	$31.06	$9.33	$14.90	$0.00	$55.29
4	65	$33.65	$9.33	$14.90	$0.00	$57.88
5	70	$36.24	$9.33	$16.69	$0.00	$62.26
6	75	$38.83	$9.33	$16.69	$0.00	$64.85
7	80	$41.42	$9.33	$18.48	$0.00	$69.23
8	85	$44.00	$9.33	$18.48	$0.00	$71.81

Notes: Steps are 750 hrs.
% After 10/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)
Step 1&2 $32.94/ 3&4 $39.66/ 5&6 $60.32/ 7&8 $67.10

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.88	$14.25	$16.05	$0.00	$85.18
	12/01/2023	$56.13	$14.25	$16.05	$0.00	$86.43
	06/01/2024	$57.43	$14.25	$16.05	$0.00	$87.73
	12/01/2024	$58.88	$14.25	$16.05	$0.00	$89.18
	06/01/2025	$60.18	$14.25	$16.05	$0.00	$90.48
	12/01/2025	$61.63	$14.25	$16.05	$0.00	$91.93
	06/01/2026	$62.93	$14.25	$16.05	$0.00	$93.23
	12/01/2026	$64.38	$14.25	$16.05	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$35.90	$14.25	$16.05	$0.00	$66.20
	12/01/2023	$36.72	$14.25	$16.05	$0.00	$67.02
	06/01/2024	$37.57	$14.25	$16.05	$0.00	$67.87
	12/01/2024	$38.52	$14.25	$16.05	$0.00	$68.82
	06/01/2025	$39.37	$14.25	$16.05	$0.00	$69.67
	12/01/2025	$40.32	$14.25	$16.05	$0.00	$70.62
	06/01/2026	$41.18	$14.25	$16.05	$0.00	$71.48
	12/01/2026	$42.13	$14.25	$16.05	$0.00	$72.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 35 (ZONE 2)*	01/01/2023	$45.56	$8.65	$23.05	$0.00	$77.26
	07/01/2023	$46.76	$8.65	$23.05	$0.00	$78.46
	01/01/2024	$47.96	$8.65	$23.05	$0.00	$79.66
	07/01/2024	$49.16	$8.65	$23.05	$0.00	$80.86
	01/01/2025	$50.36	$8.65	$23.05	$0.00	$82.06

Apprentice - *GLAZIER - Local 35 Zone 2*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.78	$8.65	$0.00	$0.00	$31.43
2	55	$25.06	$8.65	$6.27	$0.00	$39.98
3	60	$27.34	$8.65	$6.84	$0.00	$42.83
4	65	$29.61	$8.65	$7.41	$0.00	$45.67
5	70	$31.89	$8.65	$19.63	$0.00	$60.17
6	75	$34.17	$8.65	$20.20	$0.00	$63.02
7	80	$36.45	$8.65	$20.77	$0.00	$65.87
8	90	$41.00	$8.65	$21.91	$0.00	$71.56

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.38	$8.65	$0.00	$0.00	$32.03
2	55	$25.72	$8.65	$6.27	$0.00	$40.64
3	60	$28.06	$8.65	$6.84	$0.00	$43.55
4	65	$30.39	$8.65	$7.41	$0.00	$46.45
5	70	$32.73	$8.65	$19.63	$0.00	$61.01
6	75	$35.07	$8.65	$20.20	$0.00	$63.92
7	80	$37.41	$8.65	$20.77	$0.00	$66.83
8	90	$42.08	$8.65	$21.91	$0.00	$72.64

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.88	$14.25	$16.05	$0.00	$85.18
	12/01/2023	$56.13	$14.25	$16.05	$0.00	$86.43
	06/01/2024	$57.43	$14.25	$16.05	$0.00	$87.73
	12/01/2024	$58.88	$14.25	$16.05	$0.00	$89.18
	06/01/2025	$60.18	$14.25	$16.05	$0.00	$90.48
	12/01/2025	$61.63	$14.25	$16.05	$0.00	$91.93
	06/01/2026	$62.93	$14.25	$16.05	$0.00	$93.23
	12/01/2026	$64.38	$14.25	$16.05	$0.00	$94.68

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *OPERATING ENGINEERS - Local 4*

Effective Date - 06/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$30.18	$14.25	$0.00	$0.00	$44.43
2	60	$32.93	$14.25	$16.05	$0.00	$63.23
3	65	$35.67	$14.25	$16.05	$0.00	$65.97
4	70	$38.42	$14.25	$16.05	$0.00	$68.72
5	75	$41.16	$14.25	$16.05	$0.00	$71.46
6	80	$43.90	$14.25	$16.05	$0.00	$74.20
7	85	$46.65	$14.25	$16.05	$0.00	$76.95
8	90	$49.39	$14.25	$16.05	$0.00	$79.69

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$30.87	$14.25	$0.00	$0.00	$45.12
2	60	$33.68	$14.25	$16.05	$0.00	$63.98
3	65	$36.48	$14.25	$16.05	$0.00	$66.78
4	70	$39.29	$14.25	$16.05	$0.00	$69.59
5	75	$42.10	$14.25	$16.05	$0.00	$72.40
6	80	$44.90	$14.25	$16.05	$0.00	$75.20
7	85	$47.71	$14.25	$16.05	$0.00	$78.01
8	90	$50.52	$14.25	$16.05	$0.00	$80.82

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2023	$55.31	$14.11	$26.64	$2.83	$98.89
	08/01/2023	$57.01	$14.11	$26.64	$2.83	$100.59
	02/01/2024	$58.71	$14.11	$26.64	$2.83	$102.29
	08/01/2024	$60.46	$14.11	$26.64	$2.83	$104.04
	02/01/2025	$62.21	$14.11	$26.64	$2.83	$105.79
	08/01/2025	$64.06	$14.11	$26.64	$2.83	$107.64
	02/01/2026	$66.01	$14.11	$26.64	$2.83	$109.59
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 96*	09/04/2022	$45.59	$12.20	$17.50	$0.00	$75.29
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2023	$55.31	$14.11	$26.64	$2.83	$98.89
	08/01/2023	$57.01	$14.11	$26.64	$2.83	$100.59
	02/01/2024	$58.71	$14.11	$26.64	$2.83	$102.29
	08/01/2024	$60.46	$14.11	$26.64	$2.83	$104.04
	02/01/2025	$62.21	$14.11	$26.64	$2.83	$105.79
	08/01/2025	$64.06	$14.11	$26.64	$2.83	$107.64
	02/01/2026	$66.01	$14.11	$26.64	$2.83	$109.59

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) *PIPEFITTERS LOCAL 537*	03/01/2023	$63.43	$12.50	$20.80	$0.00	$96.73
	09/01/2023	$65.18	$12.50	$20.80	$0.00	$98.48
	03/01/2024	$66.98	$12.50	$20.80	$0.00	$100.28
	09/01/2024	$68.78	$12.50	$20.80	$0.00	$102.08
	03/01/2025	$70.58	$12.50	$20.80	$0.00	$103.88
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PIPEFITTERS LOCAL 537*	03/01/2023	$63.43	$12.25	$20.80	$0.00	$96.48
	09/01/2023	$65.18	$12.25	$20.80	$0.00	$98.23
	03/01/2024	$66.98	$12.25	$20.80	$0.00	$100.03
	09/01/2024	$68.78	$12.25	$20.80	$0.00	$101.83
	03/01/2025	$70.58	$12.25	$20.80	$0.00	$103.63
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS *LABORERS - ZONE 2*	06/01/2023	$38.21	$9.40	$16.89	$0.00	$64.50
	12/01/2023	$39.11	$9.40	$16.89	$0.00	$65.40
For apprentice rates see "Apprentice- LABORER"						
HYDRAULIC DRILLS (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	06/01/2023	$38.21	$9.40	$16.89	$0.00	$64.50
	12/01/2023	$39.11	$9.40	$16.89	$0.00	$65.40
	06/01/2024	$40.44	$9.40	$16.89	$0.00	$66.73
	12/01/2024	$41.77	$9.40	$16.89	$0.00	$68.06
	06/01/2025	$43.16	$9.40	$16.89	$0.00	$69.45
	12/01/2025	$44.54	$9.40	$16.89	$0.00	$70.83
	06/01/2026	$45.98	$9.40	$16.89	$0.00	$72.27
	12/01/2026	$47.42	$9.40	$16.89	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	09/01/2022	$53.85	$13.80	$17.14	$0.00	$84.79

Apprentice - *ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston*

Effective Date - 09/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.93	$13.80	$12.42	$0.00	$53.15
2	60	$32.31	$13.80	$13.36	$0.00	$59.47
3	70	$37.70	$13.80	$14.31	$0.00	$65.81
4	80	$43.08	$13.80	$15.25	$0.00	$72.13

Notes:
Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (WORCESTER AREA)*	03/16/2023	$52.42	$8.35	$26.70	$0.00	$87.47
	03/16/2024	$53.67	$8.35	$26.70	$0.00	$88.72

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *IRONWORKER - Local 7 Worcester*

Effective Date - 03/16/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$31.45	$8.35	$26.70	$0.00	$66.50
2	70	$36.69	$8.35	$26.70	$0.00	$71.74
3	75	$39.32	$8.35	$26.70	$0.00	$74.37
4	80	$41.94	$8.35	$26.70	$0.00	$76.99
5	85	$44.56	$8.35	$26.70	$0.00	$79.61
6	90	$47.18	$8.35	$26.70	$0.00	$82.23

Effective Date - 03/16/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$32.20	$8.35	$26.70	$0.00	$67.25
2	70	$37.57	$8.35	$26.70	$0.00	$72.62
3	75	$40.25	$8.35	$26.70	$0.00	$75.30
4	80	$42.94	$8.35	$26.70	$0.00	$77.99
5	85	$45.62	$8.35	$26.70	$0.00	$80.67
6	90	$48.30	$8.35	$26.70	$0.00	$83.35

Notes:

Apprentice to Journeyworker Ratio:1:4

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 2*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
LABORER *LABORERS - ZONE 2*	06/01/2023	$37.46	$9.40	$16.89	$0.00	$63.75
	12/01/2023	$38.36	$9.40	$16.89	$0.00	$64.65

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER - Zone 2*

Effective Date - 06/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$22.48	$9.40	$16.89	$0.00	$48.77
2	70	$26.22	$9.40	$16.89	$0.00	$52.51
3	80	$29.97	$9.40	$16.89	$0.00	$56.26
4	90	$33.71	$9.40	$16.89	$0.00	$60.00

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$23.02	$9.40	$16.89	$0.00	$49.31
2	70	$26.85	$9.40	$16.89	$0.00	$53.14
3	80	$30.69	$9.40	$16.89	$0.00	$56.98
4	90	$34.52	$9.40	$16.89	$0.00	$60.81

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	06/01/2023	$37.46	$9.40	$16.89	$0.00	$63.75
	12/01/2023	$38.36	$9.40	$16.89	$0.00	$64.65
	06/01/2024	$39.69	$9.40	$16.89	$0.00	$65.98
	12/01/2024	$41.02	$9.40	$16.89	$0.00	$67.31
	06/01/2025	$42.41	$9.40	$16.89	$0.00	$68.70
	12/01/2025	$43.79	$9.40	$16.89	$0.00	$70.08
	06/01/2026	$45.23	$9.40	$16.89	$0.00	$71.52
	12/01/2026	$46.67	$9.40	$16.89	$0.00	$72.96

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER (Heavy & Highway) - Zone 2*

Effective Date - 06/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$22.48	$9.40	$16.89	$0.00	$48.77
2	70	$26.22	$9.40	$16.89	$0.00	$52.51
3	80	$29.97	$9.40	$16.89	$0.00	$56.26
4	90	$33.71	$9.40	$16.89	$0.00	$60.00

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$23.02	$9.40	$16.89	$0.00	$49.31
2	70	$26.85	$9.40	$16.89	$0.00	$53.14
3	80	$30.69	$9.40	$16.89	$0.00	$56.98
4	90	$34.52	$9.40	$16.89	$0.00	$60.81

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER *LABORERS - ZONE 2*	06/01/2023	$37.46	$9.40	$16.89	$0.00	$63.75
	12/01/2023	$38.36	$9.40	$16.89	$0.00	$64.65
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 2*	06/01/2023	$37.46	$9.40	$16.89	$0.00	$63.75
	12/01/2023	$38.36	$9.40	$16.89	$0.00	$64.65
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 2*	06/01/2023	$37.55	$9.40	$16.95	$0.00	$63.90
	12/01/2023	$38.45	$9.40	$16.95	$0.00	$64.80
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER *LABORERS - ZONE 2*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
	06/01/2024	$39.94	$9.40	$16.89	$0.00	$66.23
	12/01/2024	$41.27	$9.40	$16.89	$0.00	$67.56
	06/01/2025	$42.66	$9.40	$16.89	$0.00	$68.95
	12/01/2025	$44.04	$9.40	$16.89	$0.00	$70.33
	06/01/2026	$45.48	$9.40	$16.89	$0.00	$71.77
	12/01/2026	$46.92	$9.40	$16.89	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 2*	06/01/2023	$37.46	$9.40	$16.89	$0.00	$63.75
	12/01/2023	$38.36	$9.40	$16.89	$0.00	$64.65
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 2*	06/01/2023	$37.46	$9.40	$16.89	$0.00	$63.75
	12/01/2023	$38.36	$9.40	$16.89	$0.00	$64.65
This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LASER BEAM OPERATOR *LABORERS - ZONE 2*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
	06/01/2024	$39.94	$9.40	$16.89	$0.00	$66.23
	12/01/2024	$41.27	$9.40	$16.89	$0.00	$67.56
	06/01/2025	$42.66	$9.40	$16.89	$0.00	$68.95
	12/01/2025	$44.04	$9.40	$16.89	$0.00	$70.33
	06/01/2026	$45.48	$9.40	$16.89	$0.00	$71.77
	12/01/2026	$46.92	$9.40	$16.89	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2023	$46.25	$11.49	$20.37	$0.00	$78.11
	08/01/2023	$47.89	$11.49	$20.37	$0.00	$79.75
	02/01/2024	$48.89	$11.49	$20.37	$0.00	$80.75
	08/01/2024	$50.57	$11.49	$20.37	$0.00	$82.43
	02/01/2025	$51.61	$11.49	$20.37	$0.00	$83.47
	08/01/2025	$53.33	$11.49	$20.37	$0.00	$85.19
	02/01/2026	$54.41	$11.49	$20.37	$0.00	$86.27
	08/01/2026	$56.17	$11.49	$20.37	$0.00	$88.03
	02/01/2027	$57.29	$11.49	$20.37	$0.00	$89.15

Apprentice - *MARBLE & TILE FINISHER - Local 3 Marble & Tile*

Effective Date - 02/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.13	$11.49	$20.37	$0.00	$54.99
2	60	$27.75	$11.49	$20.37	$0.00	$59.61
3	70	$32.38	$11.49	$20.37	$0.00	$64.24
4	80	$37.00	$11.49	$20.37	$0.00	$68.86
5	90	$41.63	$11.49	$20.37	$0.00	$73.49

Effective Date - 08/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.95	$11.49	$20.37	$0.00	$55.81
2	60	$28.73	$11.49	$20.37	$0.00	$60.59
3	70	$33.52	$11.49	$20.37	$0.00	$65.38
4	80	$38.31	$11.49	$20.37	$0.00	$70.17
5	90	$43.10	$11.49	$20.37	$0.00	$74.96

Notes:

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MARBLE MASONS,TILELAYERS & TERRAZZO MECH *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2023	$60.37	$11.49	$22.31	$0.00	$94.17
	08/01/2023	$62.42	$11.49	$22.31	$0.00	$96.22
	02/01/2024	$63.67	$11.49	$22.31	$0.00	$97.47
	08/01/2024	$65.77	$11.49	$22.31	$0.00	$99.57
	02/01/2025	$67.07	$11.49	$22.31	$0.00	$100.87
	08/01/2025	$69.22	$11.49	$22.31	$0.00	$103.02
	02/01/2026	$70.57	$11.49	$22.31	$0.00	$104.37
	08/01/2026	$72.77	$11.49	$22.31	$0.00	$106.57
	02/01/2027	$74.17	$11.49	$22.31	$0.00	$107.97

Apprentice - *MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile*

Effective Date - 02/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$30.19	$11.49	$22.31	$0.00	$63.99
2	60	$36.22	$11.49	$22.31	$0.00	$70.02
3	70	$42.26	$11.49	$22.31	$0.00	$76.06
4	80	$48.30	$11.49	$22.31	$0.00	$82.10
5	90	$54.33	$11.49	$22.31	$0.00	$88.13

Effective Date - 08/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$31.21	$11.49	$22.31	$0.00	$65.01
2	60	$37.45	$11.49	$22.31	$0.00	$71.25
3	70	$43.69	$11.49	$22.31	$0.00	$77.49
4	80	$49.94	$11.49	$22.31	$0.00	$83.74
5	90	$56.18	$11.49	$22.31	$0.00	$89.98

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MECHANICS MAINTENANCE *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 2) *MILLWRIGHTS LOCAL 1121 - Zone 2*	01/02/2023	$41.92	$8.58	$21.57	$0.00	$72.07

Apprentice - *MILLWRIGHT - Local 1121 Zone 2*

Effective Date - 01/02/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$23.06	$8.58	$5.72	$0.00	$37.36
2	65	$27.25	$8.58	$17.93	$0.00	$53.76
3	75	$31.44	$8.58	$18.98	$0.00	$59.00
4	85	$35.63	$8.58	$20.01	$0.00	$64.22

Notes: Step 1&2 Appr. indentured after 1/6/2020 receive no pension, but do receive annuity. (Step 1 $5.72, Step 2 $6.66)
Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:4

MORTAR MIXER *LABORERS - ZONE 2*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$24.94	$14.25	$16.05	$0.00	$55.24
	12/01/2023	$25.51	$14.25	$16.05	$0.00	$55.81
	06/01/2024	$26.11	$14.25	$16.05	$0.00	$56.41
	12/01/2024	$26.77	$14.25	$16.05	$0.00	$57.07
	06/01/2025	$27.37	$14.25	$16.05	$0.00	$57.67
	12/01/2025	$28.03	$14.25	$16.05	$0.00	$58.33
	06/01/2026	$28.62	$14.25	$16.05	$0.00	$58.92
	12/01/2026	$29.29	$14.25	$16.05	$0.00	$59.59
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$30.27	$14.25	$16.05	$0.00	$60.57
	12/01/2023	$30.96	$14.25	$16.05	$0.00	$61.26
	06/01/2024	$31.68	$14.25	$16.05	$0.00	$61.98
	12/01/2024	$32.48	$14.25	$16.05	$0.00	$62.78
	06/01/2025	$33.20	$14.25	$16.05	$0.00	$63.50
	12/01/2025	$34.00	$14.25	$16.05	$0.00	$64.30
	06/01/2026	$34.72	$14.25	$16.05	$0.00	$65.02
	12/01/2026	$35.52	$14.25	$16.05	$0.00	$65.82
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
OTHER POWER DRIVEN EQUIPMENT - CLASS II *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2023	$56.06	$8.65	$23.05	$0.00	$87.76
	07/01/2023	$57.26	$8.65	$23.05	$0.00	$88.96
	01/01/2024	$58.46	$8.65	$23.05	$0.00	$90.16
	07/01/2024	$59.66	$8.65	$23.05	$0.00	$91.36
	01/01/2025	$60.86	$8.65	$23.05	$0.00	$92.56

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.03	$8.65	$0.00	$0.00	$36.68
2	55	$30.83	$8.65	$6.27	$0.00	$45.75
3	60	$33.64	$8.65	$6.84	$0.00	$49.13
4	65	$36.44	$8.65	$7.41	$0.00	$52.50
5	70	$39.24	$8.65	$19.63	$0.00	$67.52
6	75	$42.05	$8.65	$20.20	$0.00	$70.90
7	80	$44.85	$8.65	$20.77	$0.00	$74.27
8	90	$50.45	$8.65	$21.91	$0.00	$81.01

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.63	$8.65	$0.00	$0.00	$37.28
2	55	$31.49	$8.65	$6.27	$0.00	$46.41
3	60	$34.36	$8.65	$6.84	$0.00	$49.85
4	65	$37.22	$8.65	$7.41	$0.00	$53.28
5	70	$40.08	$8.65	$19.63	$0.00	$68.36
6	75	$42.95	$8.65	$20.20	$0.00	$71.80
7	80	$45.81	$8.65	$20.77	$0.00	$75.23
8	90	$51.53	$8.65	$21.91	$0.00	$82.09

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PAINTER (SPRAY OR SANDBLAST, NEW) *	01/01/2023	$46.96	$8.65	$23.05	$0.00	$78.66
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	07/01/2023	$48.16	$8.65	$23.05	$0.00	$79.86
	01/01/2024	$49.36	$8.65	$23.05	$0.00	$81.06
	07/01/2024	$50.56	$8.65	$23.05	$0.00	$82.26
	01/01/2025	$51.76	$8.65	$23.05	$0.00	$83.46

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - New*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.48	$8.65	$0.00	$0.00	$32.13
2	55	$25.83	$8.65	$6.27	$0.00	$40.75
3	60	$28.18	$8.65	$6.84	$0.00	$43.67
4	65	$30.52	$8.65	$7.41	$0.00	$46.58
5	70	$32.87	$8.65	$19.63	$0.00	$61.15
6	75	$35.22	$8.65	$20.20	$0.00	$64.07
7	80	$37.57	$8.65	$20.77	$0.00	$66.99
8	90	$42.26	$8.65	$21.91	$0.00	$72.82

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.08	$8.65	$0.00	$0.00	$32.73
2	55	$26.49	$8.65	$6.27	$0.00	$41.41
3	60	$28.90	$8.65	$6.84	$0.00	$44.39
4	65	$31.30	$8.65	$7.41	$0.00	$47.36
5	70	$33.71	$8.65	$19.63	$0.00	$61.99
6	75	$36.12	$8.65	$20.20	$0.00	$64.97
7	80	$38.53	$8.65	$20.77	$0.00	$67.95
8	90	$43.34	$8.65	$21.91	$0.00	$73.90

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT)	01/01/2023	$45.02	$8.65	$23.05	$0.00	$76.72
PAINTERS LOCAL 35 - ZONE 2	07/01/2023	$46.22	$8.65	$23.05	$0.00	$77.92
	01/01/2024	$47.42	$8.65	$23.05	$0.00	$79.12
	07/01/2024	$48.62	$8.65	$23.05	$0.00	$80.32
	01/01/2025	$49.82	$8.65	$23.05	$0.00	$81.52

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.51	$8.65	$0.00	$0.00	$31.16
2	55	$24.76	$8.65	$6.27	$0.00	$39.68
3	60	$27.01	$8.65	$6.84	$0.00	$42.50
4	65	$29.26	$8.65	$7.41	$0.00	$45.32
5	70	$31.51	$8.65	$19.63	$0.00	$59.79
6	75	$33.77	$8.65	$20.20	$0.00	$62.62
7	80	$36.02	$8.65	$20.77	$0.00	$65.44
8	90	$40.52	$8.65	$21.91	$0.00	$71.08

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.11	$8.65	$0.00	$0.00	$31.76
2	55	$25.42	$8.65	$6.27	$0.00	$40.34
3	60	$27.73	$8.65	$6.84	$0.00	$43.22
4	65	$30.04	$8.65	$19.06	$0.00	$57.75
5	70	$32.35	$8.65	$19.63	$0.00	$60.63
6	75	$34.67	$8.65	$20.20	$0.00	$63.52
7	80	$36.98	$8.65	$20.77	$0.00	$66.40
8	90	$41.60	$8.65	$21.91	$0.00	$72.16

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, NEW) *	01/01/2023	$45.56	$8.65	$23.05	$0.00	$77.26
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	07/01/2023	$46.76	$8.65	$23.05	$0.00	$78.46
	01/01/2024	$47.96	$8.65	$23.05	$0.00	$79.66
	07/01/2024	$49.16	$8.65	$23.05	$0.00	$80.86
	01/01/2025	$50.36	$8.65	$23.05	$0.00	$82.06

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 2 - BRUSH NEW*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.78	$8.65	$0.00	$0.00	$31.43
2	55	$25.06	$8.65	$6.27	$0.00	$39.98
3	60	$27.34	$8.65	$6.84	$0.00	$42.83
4	65	$29.61	$8.65	$7.41	$0.00	$45.67
5	70	$31.89	$8.65	$19.63	$0.00	$60.17
6	75	$34.17	$8.65	$20.20	$0.00	$63.02
7	80	$36.45	$8.65	$20.77	$0.00	$65.87
8	90	$41.00	$8.65	$21.91	$0.00	$71.56

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.38	$8.65	$0.00	$0.00	$32.03
2	55	$25.72	$8.65	$6.27	$0.00	$40.64
3	60	$28.06	$8.65	$6.84	$0.00	$43.55
4	65	$30.39	$8.65	$7.41	$0.00	$46.45
5	70	$32.73	$8.65	$19.63	$0.00	$61.01
6	75	$35.07	$8.65	$20.20	$0.00	$63.92
7	80	$37.41	$8.65	$20.77	$0.00	$66.83
8	90	$42.08	$8.65	$21.91	$0.00	$72.64

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2023	$43.62	$8.65	$23.05	$0.00	$75.32
	07/01/2023	$44.82	$8.65	$23.05	$0.00	$76.52
	01/01/2024	$46.02	$8.65	$23.05	$0.00	$77.72
	07/01/2024	$47.22	$8.65	$23.05	$0.00	$78.92
	01/01/2025	$48.42	$8.65	$23.05	$0.00	$80.12

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - BRUSH REPAINT*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.81	$8.65	$0.00	$0.00	$30.46
2	55	$23.99	$8.65	$6.27	$0.00	$38.91
3	60	$26.17	$8.65	$6.84	$0.00	$41.66
4	65	$28.35	$8.65	$7.41	$0.00	$44.41
5	70	$30.53	$8.65	$19.63	$0.00	$58.81
6	75	$32.72	$8.65	$20.20	$0.00	$61.57
7	80	$34.90	$8.65	$20.77	$0.00	$64.32
8	90	$39.26	$8.65	$21.91	$0.00	$69.82

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.41	$8.65	$0.00	$0.00	$31.06
2	55	$24.65	$8.65	$6.27	$0.00	$39.57
3	60	$26.89	$8.65	$6.84	$0.00	$42.38
4	65	$29.13	$8.65	$7.41	$0.00	$45.19
5	70	$31.37	$8.65	$19.63	$0.00	$59.65
6	75	$33.62	$8.65	$20.20	$0.00	$62.47
7	80	$35.86	$8.65	$20.77	$0.00	$65.28
8	90	$40.34	$8.65	$21.91	$0.00	$70.90

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	06/01/2023	$37.46	$9.40	$16.89	$0.00	$63.75
	12/01/2023	$38.36	$9.40	$16.89	$0.00	$64.65
	06/01/2024	$39.69	$9.40	$16.89	$0.00	$65.98
	12/01/2024	$41.02	$9.40	$16.89	$0.00	$67.31
	06/01/2025	$42.41	$9.40	$16.89	$0.00	$68.70
	12/01/2025	$43.79	$9.40	$16.89	$0.00	$70.08
	06/01/2026	$45.23	$9.40	$16.89	$0.00	$71.52
	12/01/2026	$46.67	$9.40	$16.89	$0.00	$72.96
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$35.78	$13.41	$16.01	$0.00	$65.20
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 2)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$46.11	$9.40	$23.12	$0.00	$78.63
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 2)*	08/01/2020	$46.11	$9.40	$23.12	$0.00	$78.63

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PILE DRIVER - Local 56 Zone 2*

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	0	$0.00	$0.00	$0.00	$0.00	$0.00

Notes: Apprentice wages shall be no less than the following Steps;
(Same as set in Zone 1)
1$57.06/2$61.96/3$66.87/4$69.32/5$71.78/6$71.78/7$76.68/8$76.68

Apprentice to Journeyworker Ratio:1:5

PIPEFITTER & STEAMFITTER *PIPEFITTERS LOCAL 537*	03/01/2023	$63.43	$12.25	$20.80	$0.00	$96.48
	09/01/2023	$65.18	$12.25	$20.80	$0.00	$98.23
	03/01/2024	$66.98	$12.25	$20.80	$0.00	$100.03
	09/01/2024	$68.78	$12.25	$20.80	$0.00	$101.83
	03/01/2025	$70.58	$12.25	$20.80	$0.00	$103.63

Apprentice - *PIPEFITTER - Local 537*

Effective Date - 03/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$25.37	$12.25	$8.55	$0.00	$46.17
2	45	$28.54	$12.25	$20.80	$0.00	$61.59
3	60	$38.06	$12.25	$20.80	$0.00	$71.11
4	70	$44.40	$12.25	$20.80	$0.00	$77.45
5	80	$50.74	$12.25	$20.80	$0.00	$83.79

Effective Date - 09/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$26.07	$12.25	$8.55	$0.00	$46.87
2	45	$29.33	$12.25	$20.80	$0.00	$62.38
3	60	$39.11	$12.25	$20.80	$0.00	$72.16
4	70	$45.63	$12.25	$20.80	$0.00	$78.68
5	80	$52.14	$12.25	$20.80	$0.00	$85.19

Notes:
** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.
Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

PIPELAYER *LABORERS - ZONE 2*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
	06/01/2024	$39.94	$9.40	$16.89	$0.00	$66.23
	12/01/2024	$41.27	$9.40	$16.89	$0.00	$67.56
	06/01/2025	$42.66	$9.40	$16.89	$0.00	$68.95
	12/01/2025	$44.04	$9.40	$16.89	$0.00	$70.33
	06/01/2026	$45.48	$9.40	$16.89	$0.00	$71.77
	12/01/2026	$46.92	$9.40	$16.89	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PLUMBERS & GASFITTERS *PLUMBERS & GASFITTERS LOCAL 12*	02/26/2023	$64.69	$14.07	$18.86	$0.00	$97.62
	09/03/2023	$66.44	$14.07	$18.86	$0.00	$99.37
	03/03/2024	$68.24	$14.07	$18.86	$0.00	$101.17
	09/01/2024	$70.04	$14.07	$18.86	$0.00	$102.97
	03/02/2025	$71.84	$14.07	$18.86	$0.00	$104.77

Apprentice - *PLUMBER/GASFITTER - Local 12*

Effective Date - 02/26/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$22.64	$14.07	$6.80	$0.00	$43.51
2	40	$25.88	$14.07	$7.72	$0.00	$47.67
3	55	$35.58	$14.07	$10.51	$0.00	$60.16
4	65	$42.05	$14.07	$12.36	$0.00	$68.48
5	75	$48.52	$14.07	$14.22	$0.00	$76.81

Effective Date - 09/03/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$23.25	$14.07	$6.80	$0.00	$44.12
2	40	$26.58	$14.07	$7.72	$0.00	$48.37
3	55	$36.54	$14.07	$10.51	$0.00	$61.12
4	65	$43.19	$14.07	$12.36	$0.00	$69.62
5	75	$49.83	$14.07	$14.22	$0.00	$78.12

Notes:

** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic$69.00, Step5 with lic$76.87

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) *PIPEFITTERS LOCAL 537*	03/01/2023	$63.43	$12.00	$20.80	$0.00	$96.23
	09/01/2023	$65.18	$12.00	$20.80	$0.00	$97.98
	03/01/2024	$66.98	$12.00	$20.80	$0.00	$99.78
	09/01/2024	$68.78	$12.00	$20.80	$0.00	$101.58
	03/01/2025	$70.58	$12.00	$20.80	$0.00	$103.38
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 2*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
	06/01/2024	$39.94	$9.40	$16.89	$0.00	$66.23
	12/01/2024	$41.27	$9.40	$16.89	$0.00	$67.56
	06/01/2025	$42.66	$9.40	$16.89	$0.00	$68.95
	12/01/2025	$44.04	$9.40	$16.89	$0.00	$70.33
	06/01/2026	$45.48	$9.40	$16.89	$0.00	$71.77
	12/01/2026	$46.92	$9.40	$16.89	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
POWDERMAN & BLASTER *LABORERS - ZONE 2*	06/01/2023	$38.46	$9.40	$16.89	$0.00	$64.75
	12/01/2023	$39.36	$9.40	$16.89	$0.00	$65.65
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	06/01/2023	$38.46	$9.40	$16.89	$0.00	$64.75
	12/01/2023	$39.36	$9.40	$16.89	$0.00	$65.65
	06/01/2024	$40.69	$9.40	$16.89	$0.00	$66.98
	12/01/2024	$42.02	$9.40	$16.89	$0.00	$68.31
	06/01/2025	$43.41	$9.40	$16.89	$0.00	$69.70
	12/01/2025	$44.79	$9.40	$16.89	$0.00	$71.08
	06/01/2026	$46.23	$9.40	$16.89	$0.00	$72.52
	12/01/2026	$47.67	$9.40	$16.89	$0.00	$73.96
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
POWER SHOVEL/DERRICK/TRENCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.88	$14.25	$16.05	$0.00	$85.18
	12/01/2023	$56.13	$14.25	$16.05	$0.00	$86.43
	06/01/2024	$57.43	$14.25	$16.05	$0.00	$87.73
	12/01/2024	$58.88	$14.25	$16.05	$0.00	$89.18
	06/01/2025	$60.18	$14.25	$16.05	$0.00	$90.48
	12/01/2025	$61.63	$14.25	$16.05	$0.00	$91.93
	06/01/2026	$62.93	$14.25	$16.05	$0.00	$93.23
	12/01/2026	$64.38	$14.25	$16.05	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.88	$14.25	$16.05	$0.00	$85.18
	12/01/2023	$56.13	$14.25	$16.05	$0.00	$86.43
	06/01/2024	$57.43	$14.25	$16.05	$0.00	$87.73
	12/01/2024	$58.88	$14.25	$16.05	$0.00	$89.18
	06/01/2025	$60.18	$14.25	$16.05	$0.00	$90.48
	12/01/2025	$61.63	$14.25	$16.05	$0.00	$91.93
	06/01/2026	$62.93	$14.25	$16.05	$0.00	$93.23
	12/01/2026	$64.38	$14.25	$16.05	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$35.90	$14.25	$16.05	$0.00	$66.20
	12/01/2023	$36.72	$14.25	$16.05	$0.00	$67.02
	06/01/2024	$37.57	$14.25	$16.05	$0.00	$67.87
	12/01/2024	$38.52	$14.25	$16.05	$0.00	$68.82
	06/01/2025	$39.37	$14.25	$16.05	$0.00	$69.67
	12/01/2025	$40.32	$14.25	$16.05	$0.00	$70.62
	06/01/2026	$41.18	$14.25	$16.05	$0.00	$71.48
	12/01/2026	$42.13	$14.25	$16.05	$0.00	$72.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER *TEAMSTERS 170 - J.G. MacLellan (Lowell)*	05/01/2023	$29.50	$10.77	$6.45	$0.00	$46.72
	01/01/2024	$29.50	$11.17	$6.45	$0.00	$47.12
	05/01/2024	$30.00	$11.17	$6.55	$0.00	$47.72
	01/01/2025	$30.00	$11.57	$6.55	$0.00	$48.12
	05/01/2025	$30.50	$11.57	$6.65	$0.00	$48.72
	01/01/2026	$30.50	$11.97	$6.65	$0.00	$49.12
RECLAIMERS *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 2*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 33*	02/01/2023	$48.53	$12.78	$20.20	$0.00	$81.51
	08/01/2023	$50.03	$12.78	$20.20	$0.00	$83.01
	02/01/2024	$51.28	$12.78	$20.20	$0.00	$84.26
	08/01/2024	$52.78	$12.78	$20.20	$0.00	$85.76
	02/01/2025	$54.03	$12.78	$20.20	$0.00	$87.01
	08/01/2025	$55.53	$12.78	$20.20	$0.00	$88.51
	02/01/2026	$56.78	$12.78	$20.20	$0.00	$89.76

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ROOFER - Local 33*

Effective Date - 02/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.27	$12.78	$5.59	$0.00	$42.64
2	60	$29.12	$12.78	$20.20	$0.00	$62.10
3	65	$31.54	$12.78	$20.20	$0.00	$64.52
4	75	$36.40	$12.78	$20.20	$0.00	$69.38
5	85	$41.25	$12.78	$20.20	$0.00	$74.23

Effective Date - 08/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.02	$12.78	$5.59	$0.00	$43.39
2	60	$30.02	$12.78	$20.20	$0.00	$63.00
3	65	$32.52	$12.78	$20.20	$0.00	$65.50
4	75	$37.52	$12.78	$20.20	$0.00	$70.50
5	85	$42.53	$12.78	$20.20	$0.00	$75.51

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.
(Hot Pitch Mechanics' receive $1.00 hr. above ROOFER)

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 33*	02/01/2023	$48.78	$12.78	$20.20	$0.00	$81.76
	08/01/2023	$50.28	$12.78	$20.20	$0.00	$83.26
	02/01/2024	$51.53	$12.78	$20.20	$0.00	$84.51
	08/01/2024	$53.03	$12.78	$20.20	$0.00	$86.01
	02/01/2025	$54.28	$12.78	$20.20	$0.00	$87.26
	08/01/2025	$55.78	$12.78	$20.20	$0.00	$88.76
	02/01/2026	$57.03	$12.78	$20.20	$0.00	$90.01
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2023	$55.31	$14.11	$26.64	$2.83	$98.89
	08/01/2023	$57.01	$14.11	$26.64	$2.83	$100.59
	02/01/2024	$58.71	$14.11	$26.64	$2.83	$102.29
	08/01/2024	$60.46	$14.11	$26.64	$2.83	$104.04
	02/01/2025	$62.21	$14.11	$26.64	$2.83	$105.79
	08/01/2025	$64.06	$14.11	$26.64	$2.83	$107.64
	02/01/2026	$66.01	$14.11	$26.64	$2.83	$109.59

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SHEET METAL WORKER - Local 17-A*

Effective Date - 02/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	$23.23	$14.11	$6.13	$0.00	$43.47
2	42	$23.23	$14.11	$6.13	$0.00	$43.47
3	47	$26.00	$14.11	$11.90	$1.54	$53.55
4	47	$26.00	$14.11	$11.90	$1.54	$53.55
5	52	$28.76	$14.11	$12.88	$1.65	$57.40
6	52	$28.76	$14.11	$13.13	$1.65	$57.65
7	60	$33.19	$14.11	$14.54	$1.83	$63.67
8	65	$35.95	$14.11	$15.52	$1.94	$67.52
9	75	$41.48	$14.11	$17.48	$2.16	$75.23
10	85	$47.01	$14.11	$18.94	$2.36	$82.42

Effective Date - 08/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	$23.94	$14.11	$6.13	$0.00	$44.18
2	42	$23.94	$14.11	$6.13	$0.00	$44.18
3	47	$26.79	$14.11	$11.90	$1.58	$54.38
4	47	$26.79	$14.11	$11.90	$1.58	$54.38
5	52	$29.65	$14.11	$12.88	$1.70	$58.34
6	52	$29.65	$14.11	$13.13	$1.70	$58.59
7	60	$34.21	$14.11	$14.54	$1.89	$64.75
8	65	$37.06	$14.11	$15.52	$2.00	$68.69
9	75	$42.76	$14.11	$17.48	$2.23	$76.58
10	85	$48.46	$14.11	$18.94	$2.45	$83.96

Notes:

Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.24	$13.41	$16.01	$0.00	$65.66
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.53	$13.41	$16.01	$0.00	$65.95
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1*	03/01/2023	$66.20	$10.90	$23.20	$0.00	$100.30
	10/01/2023	$67.95	$10.90	$23.20	$0.00	$102.05
	03/01/2024	$69.75	$10.90	$23.20	$0.00	$103.85
	10/01/2024	$71.55	$10.90	$23.20	$0.00	$105.65
	03/01/2025	$73.35	$10.90	$23.20	$0.00	$107.45

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SPRINKLER FITTER - Local 550 (Section A) Zone 1*

Effective Date - 03/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$23.17	$10.90	$9.70	$0.00	$43.77
2	40	$26.48	$10.90	$9.70	$0.00	$47.08
3	45	$29.79	$10.90	$9.70	$0.00	$50.39
4	50	$33.10	$10.90	$9.70	$0.00	$53.70
5	55	$36.41	$10.90	$9.70	$0.00	$57.01
6	60	$39.72	$10.90	$11.20	$0.00	$61.82
7	65	$43.03	$10.90	$11.20	$0.00	$65.13
8	70	$46.34	$10.90	$11.20	$0.00	$68.44
9	75	$49.65	$10.90	$11.20	$0.00	$71.75
10	80	$52.96	$10.90	$11.20	$0.00	$75.06

Effective Date - 10/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$23.78	$10.90	$9.70	$0.00	$44.38
2	40	$27.18	$10.90	$9.70	$0.00	$47.78
3	45	$30.58	$10.90	$9.70	$0.00	$51.18
4	50	$33.98	$10.90	$9.70	$0.00	$54.58
5	55	$37.37	$10.90	$9.70	$0.00	$57.97
6	60	$40.77	$10.90	$11.20	$0.00	$62.87
7	65	$44.17	$10.90	$11.20	$0.00	$66.27
8	70	$47.57	$10.90	$11.20	$0.00	$69.67
9	75	$50.96	$10.90	$11.20	$0.00	$73.06
10	80	$54.36	$10.90	$11.20	$0.00	$76.46

Notes: Apprentice entered prior 9/30/10:
40/45/50/55/60/65/70/75/80/85
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2023	$59.29	$11.49	$22.34	$0.00	$93.12
	08/01/2023	$61.34	$11.49	$22.34	$0.00	$95.17
	02/01/2024	$62.59	$11.49	$22.34	$0.00	$96.42
	08/01/2024	$64.69	$11.49	$22.34	$0.00	$98.52
	02/01/2025	$65.99	$11.49	$22.34	$0.00	$99.82
	08/01/2025	$68.14	$11.49	$22.34	$0.00	$101.97
	02/01/2026	$69.49	$11.49	$22.34	$0.00	$103.32
	08/01/2026	$71.69	$11.49	$22.34	$0.00	$105.52
	02/01/2027	$73.09	$11.49	$22.34	$0.00	$106.92

Apprentice - *TERRAZZO FINISHER - Local 3 Marble & Tile*

Effective Date - 02/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$29.65	$11.49	$22.34	$0.00	$63.48
2	60	$35.57	$11.49	$22.34	$0.00	$69.40
3	70	$41.50	$11.49	$22.34	$0.00	$75.33
4	80	$47.43	$11.49	$22.34	$0.00	$81.26
5	90	$53.36	$11.49	$22.34	$0.00	$87.19

Effective Date - 08/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$30.67	$11.49	$22.34	$0.00	$64.50
2	60	$36.80	$11.49	$22.34	$0.00	$70.63
3	70	$42.94	$11.49	$22.34	$0.00	$76.77
4	80	$49.07	$11.49	$22.34	$0.00	$82.90
5	90	$55.21	$11.49	$22.34	$0.00	$89.04

Notes:

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	06/01/2023	$47.58	$9.40	$17.97	$0.00	$74.95
	12/01/2023	$48.83	$9.40	$17.97	$0.00	$76.20
	06/01/2024	$50.31	$9.40	$17.97	$0.00	$77.68
	12/01/2024	$51.78	$9.40	$17.97	$0.00	$79.15
	06/01/2025	$53.28	$9.40	$17.97	$0.00	$80.65
	12/01/2025	$54.78	$9.40	$17.97	$0.00	$82.15
	06/01/2026	$56.33	$9.40	$17.97	$0.00	$83.70
	12/01/2026	$57.83	$9.40	$17.97	$0.00	$85.20
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	06/01/2023	$43.70	$9.40	$17.97	$0.00	$71.07
	12/01/2023	$44.95	$9.40	$17.97	$0.00	$72.32
	06/01/2024	$46.43	$9.40	$17.97	$0.00	$73.80
	12/01/2024	$47.90	$9.40	$17.97	$0.00	$75.27
	06/01/2025	$49.40	$9.40	$17.97	$0.00	$76.77
	12/01/2025	$50.90	$9.40	$17.97	$0.00	$78.27
	06/01/2026	$52.45	$9.40	$17.97	$0.00	$79.82
	12/01/2026	$53.95	$9.40	$17.97	$0.00	$81.32
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2023	$43.58	$9.40	$17.97	$0.00	$70.95
	12/01/2023	$44.83	$9.40	$17.97	$0.00	$72.20
	06/01/2024	$46.31	$9.40	$17.97	$0.00	$73.68
	12/01/2024	$47.78	$9.40	$17.97	$0.00	$75.15
	06/01/2025	$49.28	$9.40	$17.97	$0.00	$76.65
	12/01/2025	$50.78	$9.40	$17.97	$0.00	$78.15
	06/01/2026	$52.33	$9.40	$17.97	$0.00	$79.70
	12/01/2026	$53.83	$9.40	$17.97	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.29	$14.25	$16.05	$0.00	$84.59
	12/01/2023	$55.53	$14.25	$16.05	$0.00	$85.83
	06/01/2024	$56.81	$14.25	$16.05	$0.00	$87.11
	12/01/2024	$58.25	$14.25	$16.05	$0.00	$88.55
	06/01/2025	$59.53	$14.25	$16.05	$0.00	$89.83
	12/01/2025	$60.97	$14.25	$16.05	$0.00	$91.27
	06/01/2026	$62.25	$14.25	$16.05	$0.00	$92.55
	12/01/2026	$63.69	$14.25	$16.05	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.82	$13.41	$16.01	$0.00	$66.24
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	06/01/2023	$55.81	$9.40	$18.42	$0.00	$83.63
	12/01/2023	$57.06	$9.40	$18.42	$0.00	$84.88
	06/01/2024	$58.54	$9.40	$18.42	$0.00	$86.36
	12/01/2024	$60.01	$9.40	$18.42	$0.00	$87.83
	06/01/2025	$61.51	$9.40	$18.42	$0.00	$89.33
	12/01/2025	$63.01	$9.40	$18.42	$0.00	$90.83
	06/01/2026	$64.56	$9.40	$18.42	$0.00	$92.38
	12/01/2026	$66.06	$9.40	$18.42	$0.00	$93.88
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	06/01/2023	$57.81	$9.40	$18.42	$0.00	$85.63
	12/01/2023	$59.06	$9.40	$18.42	$0.00	$86.88
	06/01/2024	$60.54	$9.40	$18.42	$0.00	$88.36
	12/01/2024	$62.01	$9.40	$18.42	$0.00	$89.83
	06/01/2025	$63.51	$9.40	$18.42	$0.00	$91.33
	12/01/2025	$65.01	$9.40	$18.42	$0.00	$92.83
	06/01/2026	$66.56	$9.40	$18.42	$0.00	$94.38
	12/01/2026	$68.06	$9.40	$18.42	$0.00	$95.88
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	06/01/2023	$47.88	$9.40	$18.42	$0.00	$75.70
	12/01/2023	$49.13	$9.40	$18.42	$0.00	$76.95
	06/01/2024	$50.61	$9.40	$18.42	$0.00	$78.43
	12/01/2024	$52.08	$9.40	$18.42	$0.00	$79.90
	06/01/2025	$53.58	$9.40	$18.42	$0.00	$81.40
	12/01/2025	$55.08	$9.40	$18.42	$0.00	$82.90
	06/01/2026	$56.63	$9.40	$18.42	$0.00	$84.45
	12/01/2026	$58.13	$9.40	$18.42	$0.00	$85.95
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	06/01/2023	$49.88	$9.40	$18.42	$0.00	$77.70
	12/01/2023	$51.13	$9.40	$18.42	$0.00	$78.95
	06/01/2024	$52.61	$9.40	$18.42	$0.00	$80.43
	12/01/2024	$54.08	$9.40	$18.42	$0.00	$81.90
	06/01/2025	$55.58	$9.40	$18.42	$0.00	$83.40
	12/01/2025	$57.08	$9.40	$18.42	$0.00	$84.90
	06/01/2026	$58.63	$9.40	$18.42	$0.00	$86.45
	12/01/2026	$60.13	$9.40	$18.42	$0.00	$87.95
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2021	$36.24	$13.41	$16.01	$0.00	$65.66
VOICE-DATA-VIDEO TECHNICIAN *ELECTRICIANS LOCAL 96*	09/04/2022	$34.19	$12.20	$15.91	$0.00	$62.30

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *VOICE-DATA-VIDEO TECHNICIAN - Local 96*

Effective Date - 09/04/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.10	$12.20	$4.27	$0.00	$33.57
2	55	$18.80	$12.20	$4.32	$0.00	$35.32
3	60	$20.51	$12.20	$15.50	$0.00	$48.21
4	65	$22.22	$12.20	$15.55	$0.00	$49.97
5	70	$23.93	$12.20	$15.60	$0.00	$51.73
6	75	$25.64	$12.20	$15.65	$0.00	$53.49
7	80	$27.35	$12.20	$15.70	$0.00	$55.25
8	85	$29.06	$12.20	$15.75	$0.00	$57.01

Notes:

Apprentice to Journeyworker Ratio:1:1

WAGON DRILL OPERATOR *LABORERS - ZONE 2*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
WAGON DRILL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	06/01/2023	$37.71	$9.40	$16.89	$0.00	$64.00
	12/01/2023	$38.61	$9.40	$16.89	$0.00	$64.90
	06/01/2024	$39.94	$9.40	$16.89	$0.00	$66.23
	12/01/2024	$41.27	$9.40	$16.89	$0.00	$67.56
	06/01/2025	$42.66	$9.40	$16.89	$0.00	$68.95
	12/01/2025	$44.04	$9.40	$16.89	$0.00	$70.33
	06/01/2026	$45.48	$9.40	$16.89	$0.00	$71.77
	12/01/2026	$46.92	$9.40	$16.89	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
WASTE WATER PUMP OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2023	$54.88	$14.25	$16.05	$0.00	$85.18
	12/01/2023	$56.13	$14.25	$16.05	$0.00	$86.43
	06/01/2024	$57.43	$14.25	$16.05	$0.00	$87.73
	12/01/2024	$58.88	$14.25	$16.05	$0.00	$89.18
	06/01/2025	$60.18	$14.25	$16.05	$0.00	$90.48
	12/01/2025	$61.63	$14.25	$16.05	$0.00	$91.93
	06/01/2026	$62.93	$14.25	$16.05	$0.00	$93.23
	12/01/2026	$64.38	$14.25	$16.05	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER *PLUMBERS & GASFITTERS LOCAL 12*	02/26/2023	$64.69	$14.07	$18.86	$0.00	$97.62
	09/03/2023	$66.44	$14.07	$18.86	$0.00	$99.37
	03/03/2024	$68.24	$14.07	$18.86	$0.00	$101.17
	09/01/2024	$70.04	$14.07	$18.86	$0.00	$102.97
	03/02/2025	$71.84	$14.07	$18.86	$0.00	$104.77
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)
Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

SECTION 01 11 13

SUMMARY OF WORK

PART 1 – GENERAL

1.1 LOCATION AND DESCRIPTION OF WORK

A. The Work is located in the Town of Ayer, Massachusetts. General characteristics, and principal details of the Work are indicated on the plans entitled: "SANDY POND ROAD SANITARY SEWER REHABILITATION", dated June 2023.

B. Work to be performed under the base bid of this Contract includes, but is not limited to, providing all materials, equipment, labor and supervision for pipeline cleaning, pre- and post-inspection by closed circuit television (CCTV), sewer pipeline rehabilitation by cured-in-place pipe lining (CIPPL), sewer lateral rehabilitation by grout injection, cured-in-place lateral lining (LCL), warranty inspections of rehabilitated sewers, and all appurtenances and related work to complete the base bid of the Contract. Sewer pipeline to be rehabilitated range in diameter from 15-inch to 24-inch within the municipal paved Rights-of-way at depths upward of 33 VF from grade.

C. The Work to be performed as an additive alternate to this Contract includes, but is not limited to, providing all materials, equipment, labor and supervision for open cut replacement of sewer manhole frames and covers, cementitious and epoxy lining, and all appurtenances and related work to complete the additive alternate bid item of the Contract

1.2 CONTRACTOR'S USE OF SITE

A. CONTRACTOR's use of the Site shall be confined to the areas as directed by the OWNER.

B. Move stored materials and equipment that interfere with operations of OWNER, other contractors, and others performing work for OWNER.

C. Assume full responsibility for protection and safekeeping of products stored on or off the Site.

D. Obtain and pay for all additional storage or work areas required for its operations.

E. The Ayer DPW Water Division will provide water for use with the CONTRACTOR's equipment requiring water to complete Work as part of this contract. Use of hydrants for pipelining work will be allowed with prior approval by the OWNER. CONTRACTOR shall request Town water use a minimum of 24-hours prior to work with location(s). The Ayer Water Division will provide and install a backflow preventer and water meter assembly at a hydrant approved for use by the OWNER. CONTRACTOR shall measure water usage and report to OWNER or ENGINEER.

1.4 EASEMENTS AND RIGHTS-OF-WAY

A. Easements and rights-of-way will be provided by Owner in accordance with the General Conditions. Confine construction operations within Owner's property, public rights-of-way, easements obtained by Owner, and the limits shown. Use care in placing construction tools, equipment, excavated materials, and materials and equipment to be incorporated into the Work to avoid damaging property and interfering with traffic. Do not enter private property outside the construction limits without permission from the owner of the property.

1.5 NOTICES TO OWNERS AND AUTHORITIES OF PROPERTIES ADJACENT TO THE WORK

A. Notify owners of adjacent property and utility owners when prosecution of the Work may affect their property, facilities, or use of property.

B. When it is necessary to temporarily obstruct access to property, or when utility service connection will be interrupted, provide notices sufficiently in advance to enable affected persons to provide for their needs. Such notifications shall comply with Laws and Regulations and, whether delivered orally or in writing, shall include appropriate information concerning the interruption and instructions on how to limit inconvenience caused thereby.

C. Notify utility owners and other concerned entities not less than 72 hours prior to cutting or closing streets or other traffic areas or excavating near Underground Facilities or exposed utilities.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SEQUENCE OF WORK

A. Perform work included in the Contract Document in the following general sequence:

1. Cleaning and CCTV inspection of sanitary sewer lines and laterals to be rehabilitated
2. Cured-in-place pipe lining
3. Service connection pressure testing / grout injection, where applicable
4. Cured-in-place lateral connection lining
5. Replacement of sewer manhole frames and covers
6. Cementitious lining of sewer manholes
7. Epoxy lining of sewer manholes

+ + END OF SECTION + +

SECTION 01 22 13

MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.1 SUMMARY

A. Scope:
   1. Items listed starting in Article 1.4 of this Section refer to and are the same pay items listed in the Bid Form and constitute all pay items for completing the Work.
   2. No direct or separate payment will be made for providing miscellaneous temporary or accessory works, plant or facility services, Contractor's field office, layout surveys, permit fees, Project signs, sanitary requirements, testing, safety provisions and safety devices, submittals and record drawings, tanker truck for water, water supplies (water may be obtained in accordance with Section 33 01 30.41), bypass pumping/flow control, power and fuel, maintenance and protection of traffic, removal of waste, security, erosion and sediment control, coordination with Owner's operations, site restoration and cleanup of public and private property disturbed or altered during the work to preconstruction condition, temporary and permanent pavement, including subgrade preparation and surface restoration, information technology (including hardware, software, and services) required during construction, commissioning where specified, compliance with permits, bonds, insurance, or other requirements of the General Conditions, Supplementary Conditions, and other requirements of the Contract Documents.
   3. Compensation for all services, items, materials, and equipment shall be included in prices stipulated for lump sum and unit price pay items listed in this Section and included in the Contract.
   4. Each unit price shall include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.
   5. Lump sum or unit price allowances are stipulated for warranty inspections and testing bid items.

1.2 ENGINEER'S ESTIMATE OF QUANTITIES

A. ENGINEER's estimated quantities for items of Unit Price Work, as included in the Contract, are approximate only and are included solely for purpose of comparing Bids and pricing. OWNER does not expressly or by implication agree that nature of materials encountered below the ground surface or actual quantities of material encountered or required will correspond with the quantities included in the Contract at the time of award and reserves right to increase or decrease quantities or to eliminate quantities as OWNER may deem necessary. Except as provided in

Article 1.3 of this Section, CONTRACTOR or OWNER will not be entitled to adjustment in price of Unit Price Work items as a result of change in estimated quantity and agrees to accept the unit prices accepted in the Bid as complete and total compensation for additions caused by changes or alterations in the Unit Price Work directed by OWNER.

1.3 RELATED PROVISIONS

A. Payments to CONTRACTOR: Refer to General Conditions, Supplementary Conditions, and Agreement.

B. Changes in Contract Price: Refer to General Conditions and Supplementary Conditions.

C. Engineer's Estimate of Quantities: Refer to General Conditions and Supplementary Conditions.

D. Adjustment of Unit Prices for Increase or Decrease of Estimated Quantities: Refer to General Conditions and Supplementary Conditions.

E. Correction, Removal, or Acceptance of Defective Work: Refer to General Conditions and Supplementary Conditions.

1.4 BID ITEMS

A. Item 1 – Sanitary Sewer Cleaning and CCTV Inspection

1. Measurement: The quantity of sewer lines cleaned and inspected pre- and post-inspection or rehabilitation as specified in Section 33 01 30.16 Television Inspection of Sewers and Section 33 01 30.41 Cleaning of Sewers, will be measured in linear feet from center line of manhole to center line of manhole horizontally along the center line for each pipe size cleaned and inspected.

2. Payment: The payment for sewer cleaning and CCTV inspection shall be based on the pipe size and actual linear feet of pipeline cleaned and CCTV inspected. The unit price per linear foot for sewer cleaning will be full compensation for providing all labor, equipment, tools, flow plugging and bypass pumping, dewatering pipeline sags, environmental protection, transportation and disposal fees, clearing obstruction (including roots), inspection reports, external hard drives, with inspection videos and reports, and reproductions, and all other incidentals required to complete cleaning and CCTV inspection of sewer pipe as specified in Section 33 01 30.16 Television Inspection of Sewers and in Section 33 01 30.41 Cleaning of Sewers. Each manhole-to-manhole reach shall be paid once under this pay item. All pipe segments requiring rehabilitation shall be cleaned prior to rehabilitation work being conducted. CONTRACTOR will not be entitled to payment for reverse set-ups (i.e. relocating to upstream

or downstream manhole to complete televising pipe segment). Payment for cleaning of lateral connections and manholes, pre- and post-CCTV inspections for cured-in-place pipe lining, reinstatement of service connections, testing and sealing service connections, lateral connection lining and warranty inspections are paid under other pay items.

B. Item 2 – Grinding of Protruding Service Connections

1. Measurement: The quantity of ground service connections or other protruding material will be measured by the actual number of service connections, protruding pipe material, foreign material at joints, and excess mortar between joints ground.

2. Payment: The payment for grinding of service connections or other protruding material shall be based on the unit price per service connection or other protruding material. The unit price per service connection for grinding of service connections or other protruding material will be full compensation for providing all labor, flow bypassing, removal and disposal of materials, equipment, tools, and all other incidentals required to grind service connections as specified in Section 33 01 30.43, Removal of Protruding Service Connections.

C. Item 3 – Reinstatement of Service Connections by Remote (Trenchless) Method

1. Measurement: The quantity of service connections reinstated shall be measured by the actual number of service connections reinstated, by the trenchless method. Measurement will only apply to reinstating service connections that are associated with the work completed as part of the cured-in-place pipe lining.

2. Payment: The payment for reinstating service connections shall be based on the unit price per service connection reinstated. The unit price per service connection for reinstatement of service connections by remote method will be full compensation for providing for all labor, flow bypassing, removal and disposal of materials, equipment, tools and all other incidentals necessary to perform the work as specified in Section 33 31 71, Sanitary Sewer Service Reconnection. Pre-rehabilitation and television inspection, root treatment, grinding of protruding service connections, testing and sealing of service connections and chemical grout sealing material are paid under other bid items.

D. Item 4 – Cured-In-Place Lateral Lining

1. Measurement: The quantity of sewer laterals rehabilitated by the cured-in-place lateral connection lining method from the mainline sewer will be measured by the actual number of lateral liners installed 2 linear feet in length up the lateral.

2. Payment: The unit price for cured-in-place lateral liner installation will include full compensation for providing all labor, materials, equipment, tools, and incidentals for the cleaning, pre- and post-rehabilitation CCTV inspection of up to 6 linear feet of laterals, grouting as needed to stop infiltration, and installation of full-wrap lateral connection liners extending 2 linear feet in length up the lateral. The price paid per lateral connection liner shall also include water, cleaning of service laterals, grouting of lateral connections to stop infiltration (where applicable), pre- and post-rehabilitation closed-circuit television inspections of all laterals rehabilitated, inspection reports, external hard drives with inspection videos and reports, reproductions, review of pertinent drawings and specifications, locating lateral connections, confirming active service connections, determination of liner thickness, sampling and testing of liner, clearing obstructions (including roots and grease), site excavation and erosion control (where applicable), site restoration and cleanup, flow plugging and bypass pumping, sealing liners at lateral and mainline connections, removal and disposal of excess material, transportation and disposal fees, and all other items necessary to perform the work as specified in Section 33 01 30.74, Cured-In-Place Lateral Lining. No additional compensation will be provided additional linear footage for Cured-in-Place Lateral Liners extending more than 2 linear feet up the lateral. Mainline cleaning and CCTV inspections, CIPPL installations, and trenchless reinstatement of service connections are paid under separate bid items.

E. Item 5 – CIPPL Warranty Inspections

1. Measurement: Warranty Inspections will be measured in linear feet from center of manhole to center of manhole horizontally along the centerline of the sewer line inspected.

2. Payment: The unit price for CIPPL warranty inspections will include full compensation for providing all labor, materials, equipment, tools and all other incidentals required to complete the warranty inspections. The unit price shall also include water usage, manhole to manhole cleaning, flow plugging and bypass pumping, closed circuit television inspections, external hard drives, with inspection videos and reports, and reproductions, removal and disposal of material, transportation and disposal fees, environmental protection, site restoration and cleanup, and all other items and incidentals necessary to complete the work as specified and shown. The unit price for CIPPL warranty inspection is fixed by the OWNER and is independent of pipe diameter. No additional compensation will be provided for repairs and follow-on post-repair inspections completed during the warranty period or subsequent warranty re-

inspections for repairs made if the work fails the initial re-inspection as specified in Section 33 01 30.72, Cured-in-Place Pipe Lining – Water Steam Cured, Section 33 01 30.73, Cured-in-Place Pipe Lining – UV Cured, and Section 33 01 30.74, Cured-in-Place Lateral Lining. Warranty inspections for chemically sealed services, and manhole rehabilitation are paid under separate bid items.

F. Item 6 – Chemical Sealing of Service Connections

1. Measurement: The quantity of service connections chemically sealed will be measured by the actual number of service connections tested and/or chemically sealed.

2. Payment: The payment for testing and chemically sealing service connections shall be based on the actual number of service connections tested and/or sealed for each service connection. The unit price per service connection tested and sealed for chemical sealing of sewer pipe service connections will include full compensation for providing for all labor, materials (including chemical grout sealing material and additives), equipment, tools and incidentals for testing and chemically sealing service connections. The price paid per service connection tested and/or sealed shall also include, site restoration and cleanup, all sewer flow bypassing and bypass pumping, pressure testing and re-testing, of all service connections chemically sealed, disposal of any and all excess material, test logs, post-sealing television inspection, portable hard drives and reproductions, and all other items necessary to perform the work as specified in Section 33 01 30.65, Pressure Testing of Sewer Pipe Joints and Tap Connections. Grouting of services connections prior to installation Cured-in-Place Lateral Liners and grouting to stop infiltration in manholes as preparation for cementitious and epoxy lining of manholes are paid for under separate bid items.

G. Item 7 – Sealed Service Connection Warranty Testing

1. Measurement: The lump sum payment for sealed service connection warranty testing will be full compensation for providing warranty testing of all previously sealed service connections.

2. Payment: The lump sum price for sealed service connection warranty testing will be full compensation for providing all labor, materials, equipment, tools and incidentals for re-testing and sealing service connections and lateral pipe joints that fail the warranty testing. The lump sum price includes site restoration and cleanup, grout, disposal of any and all excess material, flow control and bypass pumping, test records, television inspection, portable hard drives and reproductions, subsequent re-testing and grout sealing of sealed joints which fail the initial warranty testing and any subsequent warranty testing and sealing until sealed services pass warranty testing, and all other items and incidentals necessary to complete the work as specified and shown. The lump sum price

for sealed service connection warranty testing has been fixed by the OWNER. No additional compensation will be provided for chemical grout material used to reseal failed service connections.

H. Item 8 - Alternative Bid Item No. 1, Steam or Hot Water Cured-In-Place Pipe Lining or Alternative Bid Item No. 2, UV Cured-In-Place Pipe Lining

1. Measurement: The quantity of sewer lines rehabilitated by the cured-in-place pipe liner (CIPPL) method will be measured in linear feet from center line of manhole to center line of manhole horizontally along the center line for each pipe size rehabilitated as specified in Section 33 01 30.72, Cured-in-Place Pipe Lining – Steam Cured or Section 33 01 30.73, Cured-in-Place Pipe Lining – UV Cured.

2. Payment: The payment for sewer lines rehabilitated by the CIPPL method shall be based on the actual linear feet of rehabilitated pipeline for each pipe size. The unit price per linear foot for CIPPL rehabilitation will include full compensation for providing all labor, materials, equipment, tools and all other incidentals required to complete CIPPL installations. The unit price paid per linear foot for CIPPL rehabilitation shall also include, pre- and post-closed circuit television inspections, inspection reports, external hard drives with inspection videos and reports, and reproductions, review of pertinent drawings and specifications, design for liner thicknesses, liner sampling and testing, clearing obstructions, site excavation and environmental protection (erosion control where applicable), site restoration and cleanup, flow plugging and bypass pumping, sealing liners at insertion receiving and intermediate manhole connections, grouting pipe joints to stop infiltration (where applicable), installation of pre-liner (where applicable), removal and disposal of excess material, transportation and disposal fees, permits for discharge or disposal of curing water, and all other items necessary to perform the work for all rehabilitated pipelines as specified in Section 33 01 30.72, Cured-in-Place Pipe Lining – Steam Cured or Section 33 01 30.73, Cured-in-Place Pipe Lining – UV Cured.. Trenchless reinstatement of sewer connections, chemical sealing service connections, and lateral connection lining are paid under separate bid items.

I. Item 9 –Mobilization and Demobilization (For Alternative No.1 or No.2)

1. Measurement: The lump sum price for this item shall constitute full compensation for initiating the contract, exclusive of the cost of materials, including all insurance, bonds, site preparation, furnishing of temporary facilities, any permitting required of Contractor and in general the costs associated with establishing the work on site to assure it is proceeding in a continuous manner.

2. Payment: Payment for Mobilization shall include compensation for all preliminary and organizational bidding expenses; moving materials and equipment onto the jobsite; project signs; pre-construction surveys; field office installation, including utilities; site preparation, including the installation of temporary construction fencing and of siltation and erosion control measures as required; and the general costs associated with establishing the Work on site to assure that it is proceeding in a continuous manner. Payment for Demobilization shall include complete clean-up and removal of all materials, supplies, equipment, debris, and temporary structures or utilities and restoration of site to the satisfaction of the OWNER and ENGINEER.

   The lump sum price for the item shall not exceed five percent (5%) of the total amount bid for Items 1 through 7, inclusive and bid items 8.1a through c or 8.2a through c. Payment for mobilization and demobilization shall be payable as follows: (a) up to 75% of the total bid item price when the Contractor is operational on the site and (b) the remaining 25% of the total bid item price after project acceptance by the Owner and complete demobilization by the contractor, including removal of all equipment, materials and debris and site clean-up and restoration.

Additive Alternate Bid Items

J. Item 10 – Manhole Rehabilitation - Frame and Cover Replacement

1. Measurement: The quantity of manhole frames and covers replaced shall be measured by the actual number of manhole frames and covers replaced.

Payment: The unit price for manhole frame and cover replacement will include full compensation for providing all labor, materials, equipment, tools, pavement saw cutting, excavation, removing existing soil, bricks/blocks, grade rings, demolition of existing manhole chimney as required to detach existing manhole frame and cover and to a competent layer of brick/block, chimney repair or replacement of up to twelve (12) inches of depth as measured from the bottom of the frame, laying and compaction of backfill, concrete collar, and new pavement, restoration of unpaved area if manhole is not located in the road, transportation and disposal fees, and incidentals as outlined in Section 33 01 30.81 Manhole Rehabilitation.

K. Item 11 –Manhole Rehabilitation - Cementitious Lining

1. Measurement: The quantity of manholes rehabilitated using fiber reinforced cementitious lining will be the total vertical feet of manhole depth rehabilitated. Measurement will be based on the actual vertical footage of cementitious lining applied measured from the vertical centerline of the manhole from the top of the manhole liner (base of frame) to the bottom of liner (lowest invert of the manhole).

2. Payment: The payment for manhole cementitious lining shall be based on the unit price per actual vertical foot of the manhole and will include full compensation for providing all labor, materials, equipment, tools and incidentals for cementitious lining manholes as outlined in Section 33 01 30.81 Manhole Rehabilitation. The unit price shall also include, but is not limited to, flow plugging and bypass pumping, pressure cleaning, removal and disposal of debris and excess material, transportation and disposal fees, stopping all leaks, manhole repairs (chimney, wall, invert and bench), patching, filling and repairing non-infiltrating holes, cracks and breaks, sealing pipe-to-manhole connections, testing, site restoration and all other incidentals required to complete the work as specified in Section 33 01 30.81 Manhole Rehabilitation.

L. Item 12 – Manhole Rehabilitation - Epoxy Lining

1. Measurement: The quantity of manholes rehabilitated using epoxy lining will be the total vertical feet of manhole depth rehabilitated. Measurement will be based on the actual vertical footage of epoxy liner applied measured from the vertical centerline of the manhole from the top of the liner (base of frame) to the bottom of liner (lowest invert of the manhole).

2. Payment: The payment for manhole epoxy lining shall be based on the unit price per actual vertical foot of the manhole and will include full compensation for providing all labor, materials, equipment, tools and incidentals required for epoxy lining manholes as outlined in Section 33 01 30.81 Manhole Rehabilitation. The unit price shall also include, but is not limited to, flow plugging and bypass pumping, manhole repairs (chimney, wall, invert and bench), patching, filling and repairing non-infiltrating holes, cracks and breaks, pressure cleaning, removal and disposal of debris and excess material, transportation and disposal fees, stopping all leaks, sealing pipe-to-manhole connections, testing, site restoration and all other incidentals required to complete the work as specified in Section 33 01 30.81 Manhole Rehabilitation.

M. Item 13 – Manhole Warranty Inspection

1. Measurement: The quantity of manholes surface inspected for warranty purposes shall be based on the actual number of surface inspected manholes. The manhole warranty inspections will be completed for 100% of the manholes rehabilitated as specified in Section 33 01 30.81 Manhole Rehabilitation.

2. Payment: The lump sum price for manhole warranty inspections will include full compensation for providing all labor, materials, equipment, tools, and incidentals required to complete the warranty inspections. The lump sum price also includes water, cleaning, preparation and submission of inspection logs, external hard drives with inspection reports, reproductions, review of pertinent drawings and specifications, environmental protection (erosion control where applicable), site restoration and cleanup, flow plugging and bypass pumping, and all other items and incidentals necessary to complete the work as specified in Section 33 01 30.81 Manhole Rehabilitation. The lump sum price for sealed service connection warranty testing is fixed by the OWNER. No additional compensation will be provided for repairs and follow-on post-repair inspections completed during the warranty period or subsequent warranty re-inspections for repairs made if the work fails the initial re-inspection as specified in Section 33 01 30.81 Manhole Rehabilitation. The lump sum price to be paid for this item has been set by the Owner.

N. Item 14 –Mobilization and Demobilization

1. Measurement: The lump sum price for this item shall constitute full compensation for initiating the contract, exclusive of the cost for materials, including all insurance, bonds, site preparation, furnishing of temporary facilities, any permitting required of Contractor and in general the costs associated with establishing the work on-site to assure it is proceeding in a continuous manner.

2. Payment: Payment for Mobilization shall include compensation for all preliminary and organizational bidding expenses; moving materials and equipment onto the jobsite; project signs; pre-construction surveys; field office installation, including utilities; site preparation, including the installation of temporary construction fencing and of siltation and erosion control measures as required; and the general costs associated with establishing the Work on site to assure that it is proceeding in a continuous manner. Payment for Demobilization shall include complete clean-up and removal of all materials, supplies, equipment, debris, and temporary structures or utilities and restoration of site to the satisfaction of the OWNER and ENGINEER.

The lump sum price for this item shall not exceed five percent (5%) of the

total amount bid for Items 10 through 13, inclusive. Payment for mobilization and demobilization shall be payable as follows: (a) up to 75% of the total bid item price when the Contractor is operational on the site and (b) the remaining 25% of the total bid item price after project acceptance by the Owner and complete demobilization by the contractor.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 23 00

ALTERNATIVES

PART 1 – GENERAL

1.1 SCOPE

A. Scope:
   1. This Section identifies each alternative and describes the basic changes that shall be incorporated into the Work when that alternative is made part of the Work.
   2. When alternative item(s) are included in the Work as awarded by OWNER, CONTRACTOR shall provide all labor, materials, equipment, tools, and incidentals required to provide the Work included under the alternative(s) so awarded.
   3. The OWNER reserves the right to award alternative item quantities based on and up to available funding.

B. Coordination:
   1. CONTRACTOR shall coordinate related Work as required to complete the Work under each alternative included in the Work. Include as part of each alternative miscellaneous devices, accessories, and similar items incidental to or required for a complete installation whether or not shown or indicated as part of the alternative.
   2. Notification: Immediately following award of the Contract, notify in writing each entity involved of the status of each alternative item. In such notice, indicate which alternative items have been accepted, rejected, or deferred for later consideration, and include complete description of negotiated modifications to alternatives.

1.2 DESCRIPTION OF ALTERNATIVES

A. Alternative Item No. 1: Steam or Hot Water Cured-In-Place Pipe Lining
   1. Description:
      a. This alternative bid item includes the use of steam or water cured-in-place lining to rehabilitate sanitary sewer pipes as an alternative to UV cured-in-place pipe lining.
   2. Provide the Following:
      a. Steam/Hot Water Cured-in-Place Pipe Lining of approximately 550 LF of 15-inch diameter sewer pipe.
      b Steam/Hot Water Cured-in-Place Pipe Lining of approximately 4,550 LF of 21-inch diameter sewer pipe.

c. Steam/Hot Water Cured-in-Place Pipe Lining of approximately 3,100 LF of 24-inch diameter sewer pipe.

3. Refer to Section:
   a. Section 33 01 30.72, Cured-in-Place Pipe Lining – Steam Cured

B. Alternative Item No. 2: Ultraviolet (UV) Cured-in-Place Pipe Lining
1. Description:
   a. This alternative bid item includes the use of Ultraviolet (UV) cured-in-place lining to rehabilitation sanitary sewer pipes as an alternative to Steam or Hot Water Cured-in-Place Pipe Lining.
2. Provide the Following:
   a. UV Cured-in-Place Pipe Lining of approximately 550 LF of 15-inch diameter sewer pipe.
   b UV Cured-in-Place Pipe Lining of approximately 4,550 LF of 21-inch diameter sewer pipe.
   c. UV Cured-in-Place Pipe Lining of approximately 3,100 LF of 24-inch diameter sewer pipe.
3. Refer to Section:
   a. Section 33 01 30.73, Cured-in-Place Pipe Lining – UV Cured

C. Additive Alternate Bid Items: Sewer Manhole Rehabilitation
1. Description:
   a. Rehabilitation of sanitary sewer manholes by means of any combination of open cut replacement of sewer manhole frames and covers, cementitious lining, and epoxy lining, mobilization, and warranty inspections.
2. Provide the Following:
   a. Replace with new up to 8 sewer manhole frames and covers.
   b. Line sewer manhole exposed interior surface with fiber reinforced cementitious lining material for manholes approximated as a total 550 VF.
   c. Line sewer manholes exposed interior surface with a monolithic epoxy coating for manholes approximated as a total 600 VF.
2. Refer to Section:
   a. Section 33 05 13, Manholes and Structures Connections.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope: Section includes:
   1. Administrative and procedural requirements for selecting materials and equipment for the Project.
   2. Procedural requirements for substitutions of materials and equipment.
   3. Procedural requirements for substitute construction methods or procedures, when construction methods or procedures are specified.

B. A proposed substitute will not be accepted for review if:
   1. Approval would require changes in design concept or a substantial revision of the Contract Documents.
   2. Approval would delay completion of the Work or the work of other contractors.
   3. Substitution request is indicated or implied on a Shop Drawing or other submittal, or on a request for interpretation or clarification, and is not accompanied by CONTRACTOR's formal and complete request for substitution.

C. If proposed substitute is not approved, CONTRACTOR shall provide the specified materials, equipment, method, or procedure, as applicable.

D. Approval of a substitute does not relieve CONTRACTOR from requirement for submitting Shop Drawings and other submittals in accordance with the Contract Documents.

E. ENGINEER and OWNER have the right to rely upon the completeness and accuracy of the information included in CONTRACTOR's request for approval of a substitute, and CONTRACTOR accepts full responsibility for the completeness and accuracy thereof.

F. When approved substitute is defective or fail to perform in accordance with the Contract Documents, responsibility for remedying the defect or failure resides solely with CONTRACTOR and Supplier.

1.2 SUBSTITUTE MATERIALS AND EQUIPMENT

A. Requests for approval of substitute items of materials or equipment will be considered within a period of 30 days after the Effective Date of the Contract. After the end of specified period, substitution requests will be considered only in case of unavailability of a specified item of material or equipment or other conditions beyond CONTRACTOR's control.

B. Procedure:
   1. Submit to ENGINEER 4 printed copies of each request for substitution.
   1. Submit requests for substitution in accordance with requirements for furnishing submittals, as indicated in Section 01 33 00, Submittal Procedures.
   2. Submit separate request for each proposed substitute.
   3. Submit request for substitution using forms attached to this Section. Complete all information requested on each form, and enclose with the forms supplementary information as required. In addition to requirements of the General Conditions and information required on substitution request forms, include with each substitute request the following:
      a. Identification of the materials and equipment (as applicable), including manufacturer's name and address.
      b. Manufacturer's literature with description of the materials and equipment, performance and test data, and reference standards with which materials and equipment comply.
      c. Samples, when appropriate.
      d. Name and address of similar projects on which the materials and equipment were used, date of installation, and names and contact information (including telephone number) for the facility operations and maintenance manager.

1.3 SUBSTITUTE CONSTRUCTION METHODS OR PROCEDURES

A. Where construction methods or procedures are specified, for a period of 30 days after the Effective Date of the Contract, ENGINEER will consider CONTRACTOR's written requests for substitute construction methods or procedures shown or specified in the Contract Documents.

B. The provisions of the General Conditions, as may be modified by the Supplementary Conditions, regarding substitute items of materials and equipment are hereby extended to apply to substitute construction methods or procedures.

C. Procedure:
   1. Submit to ENGINEER 4 printed copies of each request for substitution.
   2. Submit requests for substitution in accordance with requirements for furnishing submittals, as indicated in Section 01 33 00, Submittal Procedures.
   3. Submit separate request for each proposed substitute.
   4. Submit request for substitution using forms attached to this Section. Complete all information requested on each form, and enclose with the forms supplementary information as required. In addition to requirements of the

General Conditions and information required on substitution request forms, include with each substitute request the following:

a. Detailed description of proposed method or procedure.
b. Itemized comparison of the proposed substitution with the specified method or procedure.
c. Drawings illustrating method or procedure.
d. Other data required by ENGINEER to establish that proposed substitution is equivalent to specified method or procedure.

1.4 CONTRACTOR'S REPRESENTATIONS

A. In submitting request for substitution, CONTRACTOR represents that:
   1. CONTRACTOR has read and fully understands the provisions regarding substitutes as indicated in the General Conditions, as may be modified by the Supplementary Conditions.

   2. Substitution request is complete and includes all information required by the Contract Documents.

   3. CONTRACTOR certifications required by the General Conditions, as may be modified by the Supplementary Conditions, are valid and made with CONTRACTOR's full knowledge, information, and belief.

   4. CONTRACTOR will provide the same or better guarantees or warranties for proposed substitute as for the specified materials, equipment, methods, or procedures, as applicable.

   5. CONTRACTOR waives all Claims for additional costs or extension of time related to proposed substitute that subsequently may become apparent.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 ATTACHMENTS

A. The documents listed below, and attached following this Section's "End of Section" designation, are part of this Specification Section.
   1. Substitution Request Form (two pages).
   2. Product Substitution Checklist (one page).

+ + END OF SECTION + +

SUBSTITUTION REQUEST

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ Engineer Project. No. _____

Re: _____ Contract For: _____

Specification _____ Title: ____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitute: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Installer: _____ Address: _____ Phone: _____

History: ☐ New product ☐ 1 to 4 years old ☐ 5 to 10 years old ☐ More than 10 years old

Differences between proposed substitute and specified item: _____

_____

_____

☐ Point-by-point comparative data attached — REQUIRED BY THE CONTRACT DOCUMENTS

Reason for not providing specified item: _____

_____

Similar Installation:

Project: _____ Engineer: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

_____

Savings to Owner for accepting substitute: ($)
(attach detailed, itemized estimate)

_____ _____

Proposed substitute changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days.
(clarify whether change is to Substantial Completion, Milestone, or time for readiness for final payment)

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

SUBSTITUTION REQUEST
(Continued)

☐ Substitute product, method, or procedure is subject to payment of licensing fee or royalty (check if "yes" and attach information)

☐ Substitute product, method, or procedure is patented or copyrighted (check if "yes" and attach information)

The undersigned certifies:

- Representations in the General Conditions and in Section 01 25 00, Substitution Procedures, regarding substitutions are valid.
- Same or better warranty and guarantee will be furnished for proposed substitution as for specified item.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitute will have no adverse effect on other trades and will not affect or delay Progress Schedule.
- Cost data as stated above is complete. Claims for additional costs or time related to accepted substitution which may subsequently become apparent are waived.
- Proposed substitute does not affect dimensions and functional clearances.
- Payment will be made for Engineer's review and changes, if any, to the design and Contract Documents, and construction costs caused by the substitute.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: ☐

ENGINEER'S REVIEW AND ACCEPTANCE (OR NON-ACCEPTANCE) WILL BE DOCUMENTED IN A FIELD ORDER OR CHANGE ORDER, AS APPROPRIATE. _____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ Engineer ☐ Other:

Adapted from CSI Form No. 13.0B, 2004 edition

PRODUCT SUBSTITUTION CHECKLIST

Date: _____ Re: _____

Engineer Proj No.: _____ Manufacturer's Project No.: _____

Filing No.: _____ Contract For: _____

Item Equivalence:

☐ Is the submitted item equivalent to the specified item? _____

☐ Does it serve the same function? _____

☐ Does it have the same dimensions? _____

☐ Does it have the same appearance? _____

☐ Will it last as long? _____

☐ Does it comply with the same codes, and standards and performance requirements? _____

☐ Has the item been used locally, and where are the projects? _____

_____

☐ Has a problem occurred with the item, and what was the remedy? _____

_____

Effect on the Project:

☐ Will the substitute affect other aspects of the construction? _____

☐ Are any details affected and are changes required? _____

☐ What is the cost of the changes? _____

☐ Who pays for the required changes? _____

☐ Are Contract Times affected? _____

_____

Effect on the Warranty:

☐ How does the proposed warranty differ from the specified warranty? _____

_____

☐ Does the manufacturer have a track record of standing behind the warranty? _____

_____

Adapted from CSI Form No. 20.3, 1998 edition

SECTION 01 31 13

PROJECT COORDINATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall coordinate the Work, including testing agencies whether hired by CONTRACTOR, OWNER, or others; Subcontractors, Suppliers, and others with whom coordination is necessary, in accordance with the General Conditions, Supplementary Conditions, and this Section, to perform the Work within the Contract Times and in accordance with the Contract Documents.

B. Coordination:
   1. In accordance with the General Conditions as may be modified by the Supplementary Conditions, CONTRACTOR shall cooperate with and coordinate the Work with other contractors, utility owners, utility service companies, OWNER's and facility manager's employees working at the Site, and other entities working at the Site, in accordance with Section 01 11 13, Summary of Work.

   2. CONTRACTOR will not be responsible or liable for damage unless damage is through negligence of CONTRACTOR, or Subcontractors, Supplier, or other entity employed by CONTRACTOR.

   3. Attend and participate in all project coordination and progress meetings, and report on the progress of the Work and compliance with the Progress Schedule.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 31 19.13

PRE-CONSTRUCTION CONFERENCE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. A pre-construction conference will be held for the Project.
   2. CONTRACTOR shall attend the conference prepared to discuss all items on the pre-construction conference agenda.
   3. ENGINEER will distribute an agenda, preside at conference, and prepare and distribute minutes to all conference participants and others as requested.

B. Purpose of Pre-construction Conference:
   1. Purpose of conference is to designate responsible personnel, establish working relationships, discuss preliminary schedules submitted by CONTRACTOR, and review administrative and procedural requirements for the Project.
   2. Matters requiring coordination will be discussed and procedures for handling such matters will be established.
   3. Unless otherwise indicated in the Contract Documents or otherwise agreed to by the entities involved, Site mobilization meeting will be part of the pre-construction conference.

1.2 PREPARATION FOR PRE-CONSTRUCTION CONFERENCE

A. Date, Time, and Location:
   1. Conference will be held after execution of the Contract and before Work starts at the Site.
   2. ENGINEER will establish the date, time, and location of conference and notify the interested and involved entities.

B. Submittals Required Prior to Pre-construction Conference:
   1. Not less than three days prior to pre-construction conference, submit the following preliminary schedules in accordance with the General Conditions and other requirements of the Contract Documents:
      a. Preliminary Progress Schedule.
      b. Preliminary Schedule of Submittals.
      c. Preliminary Schedule of Values.
      d. Listing of identity and general scope of Work or supply (as applicable) of planned Subcontractors and Suppliers. Indicate extent of each

Subcontract proposed and overall percentage of Contract Price to be subcontracted.

C. CONTRACTOR shall furnish information required and contribute appropriate items for discussion at the pre-construction conference.

D. Handouts for Pre-Construction Conference:
   1. CONTRACTOR shall bring to the conference the following, with sufficient number of copies for each attendee:
      a. Preliminary Progress Schedule, as submitted to ENGINEER.
      b. Preliminary Schedule of Submittals, as submitted to ENGINEER.
      c. Preliminary Schedule of Values, as submitted to ENGINEER.
      d. Listing of identity and general scope of Work or supply of planned Subcontractors and Suppliers.
      e. List of emergency contact information, in accordance with Article 1.5 of Section 01 35 23, Safety Requirements.
      f. Temporary Pumping Plan

1.3 REQUIRED ATTENDEES

A. Representative of each entity attending the conference shall be authorized to act on that entity's behalf.

B. Contractor Attendance: Conference shall be attended by CONTRACTOR's:
   1. Project manager.
   2. Site superintendent
   3. Project managers for major Subcontractors, and major equipment Suppliers as CONTRACTOR deems appropriate.

C. Other attendees will be representatives of:
   1. OWNER.
   2. ENGINEER.
   3. Resident Project Representative (RPR), if available.
   4. Authorities having jurisdiction over the Work, if available.
   5. Others as requested by OWNER, CONTRACTOR, or ENGINEER.

1.4 AGENDA

A. Preliminary Agenda: Be prepared to discuss in detail the topics indicated below. Revisions, if any, to the agenda below will be furnished to required attendees prior to the pre-construction conference.
   1. Procedural and Administrative:
      a. Personnel and Teams:
         1) Designation of roles and personnel.
         2) Limitations of authority of personnel, including personnel who will sign Contract modifications and make binding decisions.

3) Subcontractors and Suppliers in attendance.
4) Authorities having jurisdiction.

b. Procedures for communications and correspondence, including electronic communication protocols.
c. Copies of the Contract Documents and availability.
d. Subcontractors and Suppliers.
   1) Lists of proposed Subcontractors and Suppliers.
e. The Work and Scheduling:
   1) General scope of the Work.
   2) Contract Times, including Milestones (if any).
   3) Phasing and sequencing.
   4) Preliminary Progress Schedule.
   5) Critical path activities.
f. Safety:
   1) Responsibility for safety.
   2) Contractor's safety representative.
   3) Emergency procedures and accident reporting.
   4) Emergency contact information.
   5) Confined space entry permits.
   6) Hazardous materials communication program.
   7) Impact of Project on public safety.
g. Permits.
h. Review of insurance requirements and insurance claims.
i. Coordination:
   1) Project coordination, and coordination among contractors.
   2) Construction coordinator.
   3) Coordination with Owner's operations.
   4) Progress meetings.
   1) Preliminary Schedule of Submittals.
   2) Procedures for furnishing and processing submittals.
   3) Work not eligible for payment until submittals are approved or accepted (as required).
   4) Construction photographic documentation.
j. Submittals:
   1) Preliminary Schedule of Submittals.
   2) Submittal procedures.
   3) Contractor coordination and approval stamp.
   4) Meaning of Engineer's actions/submittal disposition.
   5) Preliminary discussion of initial, critical submittals.
   6) Construction photographic documentation.
k. Substitutes and "Or-Equals":
   1) Product options.
   2) Procedures for proposing "or-equals".
   3) Procedures for proposing substitutes.
l. Contract Modification Procedures
   1) Requests for interpretation

2) Written clarifications
3) Field Orders
4) Proposal Requests
5) Change Proposals
6) Work Change Directives.
7) Change Orders.
8) Procedure for Claims and dispute resolution

m. Payment:
1) Owner's Project financing and funding, as applicable.
2) Owner's tax-exempt status.
3) Preliminary Schedule of Values
4) Procedures for measuring for payment.
5) Retainage.
6) Progress payment procedures.
7) Prevailing wage rates and payrolls.

n. Testing and inspections, including notification requirements.
o. Disposal of demolition materials.
p. Record documents.
q. Preliminary Discussion of Contract Closeout:
1) Procedures for Substantial Completion.
2) Contract closeout requirements.
3) Correction period.
4) Duration of bonds and insurance.

2. Site Mobilization (if not covered in a separate meeting):
a. Working hours and overtime.
b. Field offices, storage trailers, and staging areas.
c. Temporary facilities.
d. Temporary utilities and limitations on utility consumption (where applicable).
e. Utility company coordination (if not done as a separate meeting).
f. Access to Site, access roads, and parking for construction vehicles.
g. Maintenance and protection of traffic.
h. Use of Site and premises.
i. Protection of property.
j. Security.
k. Temporary controls, such as sediment and erosion controls, noise controls, dust control, storm water controls, and other such measures.
l. Site barriers and temporary fencing.
m. Storage of materials and equipment.
n. Reference points and benchmarks; surveys and layouts.
o. Site maintenance during the Project.
p. Cleaning and removal of trash and debris.
q. Restoration.

3. General discussion and questions.
4. Next meeting.
5. Site visit, if required.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 31 19.23

PROGRESS MEETINGS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Progress meetings will be held throughout the Project. CONTRACTOR shall attend each progress meeting prepared to discuss in detail all items on the agenda.
   2. ENGINEER will preside at progress meetings and will prepare and distribute minutes of progress meetings to all meeting participants and others as requested.
   3. Other Meetings: On request of ENGINEER or CONTRACTOR.

1.2 PREPARATION FOR PROGRESS MEETINGS

A. Date and Time:
   1. Regular Meetings: As required on a day and time agreeable to OWNER, ENGINEER, and CONTRACTOR.
   2. Other Meetings: As required.
   3. ENGINEER will give CONTRACTOR notice of the time, place and tentative agenda of the meetings. If CONTRACTOR cannot, for compelling reasons, attend a meeting, he shall give a minimum of 2 working days notice so that the meeting may be rescheduled. CONTRACTOR may initiate a meeting by addressing a request to ENGINEER.

B. Location:
   1. The Town of Ayer DPW, 25 Brook Street, Ayer, MA 01432 or other mutually agreed upon location.

D. Handouts:
   1. CONTRACTOR shall bring to each progress meeting not less than six copies of each of the following:
      a. List of Work accomplished since the previous progress meeting.
      b. Up-to-date Progress Schedule.
      c. Up-to-date Schedule of Submittals.
      d. Detailed “look-ahead” schedule of Work planned through the next progress meeting, with specific starting and ending dates for each activity, including shutdowns, deliveries of important materials and equipment, Milestones (if any), and important activities affecting the OWNER, Project, and Site.

e. When applicable, list of upcoming, planned time off (with dates) for personnel with significant roles on the Project, and the designated contact person in their absence.

2. CONTRACTOR shall provide as-built information updates in a format to be provided by the ENGINEER and an updated construction schedule noting any changes from previous schedules, critical path elements, and upcoming events.

1.3 REQUIRED ATTENDANCE

A. Representatives present for each entity shall be authorized to act on that entity's behalf.

B. Required Attendees:
1. CONTRACTOR:
a. Project manager.
b. Site superintendent.
c. When needed for the discussion of a particular agenda item, representatives of Subcontractors and Suppliers shall attend meetings.
2. Construction coordinator (if any).
3. ENGINEER:
a. Project manager or designated representative
b. Resident Project Representative (if any).
c. Others as required by ENGINEER.
4. OWNER's representative(s), as required.
5. Others, as appropriate.
6. Representatives of the CONTRACTOR, ENGINEER and OWNER present at the meetings shall have the competence and authority to make any necessary decisions.
7. CONTRACTOR will be held liable for any and all damages, delays, costs of alterations, and other costs which result from his absence at any meeting and resulting failure to coordinate his Work with the scheduled construction activities of other contractors.
8. Where procedures have been agreed upon and coordination schedules accepted by all contractors concerned, it shall become binding upon them to follow the procedures and coordination schedules both as to time and performance.

C. When needed for the discussion of a particular agenda item, CONTRACTOR shall require representatives of Subcontractors or Suppliers to attend a meeting.

D. Representatives of the CONTRACTOR, ENGINEER and OWNER present at the meetings shall have the competence and authority to make any necessary decisions.

E. CONTRACTOR will be held liable for any and all damages, delays, costs of alterations, and other costs which result from his absence at any meeting and

resulting failure to coordinate his Work with the scheduled construction activities of other contractors.

F. Where procedures have been agreed upon and coordination schedules accepted by all contractors concerned, it shall become binding upon them to follow the procedures and coordination schedules both as to time and performance.

1.4 AGENDA

A. Preliminary Agenda: Be prepared to discuss in detail the topics listed below. Revised agenda, if any, will be furnished to CONTRACTOR prior to first progress meeting. Progress meeting agenda may be modified by ENGINEER during the Project as required.
   1. Review, comment, and amendment (if required) of minutes of previous progress meeting.
   2. Review of progress since the previous progress meeting.
   3. Planned progress through next progress meeting.
   4. Review of Progress Schedule
      a. Contract Times, including Milestones (if any)
      b. Critical path.
      c. Schedules for fabrication and delivery of materials and equipment.
      d. Corrective measures, if required.
   5. Submittals:
      a. Review status of critical submittals.
      b. Review revisions to Schedule of Submittals.
   6. Contract Modifications (if any)
      a. Requests for interpretation
      b. Written clarifications
      c. Field Orders
      d. Proposal Requests
      e. Change Proposals
      f. Work Change Directives.
      g. Change Orders.
      h. Claims.
   7. Applications for progress payments.
   8. Problems, conflicts, and observations.
   9. Quality standards, testing, and inspections.
   10. Coordination between parties.
   11. Site management issues, including access, security, maintenance and protection of traffic, maintenance, cleaning, and other Site issues.
   12. Safety.
   13. Permits.
   14. Construction photographic documentation.
   15. Record documents status.
   16. Punch list status, as applicable.
   17. Other business.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 31 26

ELECTRONIC DOCUMENT PROTOCOL

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section establishes the procedures with which the parties will comply regarding transmission or exchange of electronic data for the Project.
   2. Contractor shall provide labor, materials, tools, equipment, services, utilities, and incidentals shown, specified, and required for complying with this Section throughout the Project.
   3. This Section does not supersede the General Conditions, as may be modified by the Supplementary Conditions, regarding transmitting of the Contract Documents to Contractor after the Effective Date of the Contract.
   4. In addition to the requirements of this Section, comply with submittal requirements for exchange of electronic data in each section as specified.

B. Coordination:
   1. Except as otherwise explicitly stated herein, the terms of this Protocol will be incorporated into any other agreement or subcontract between a party and any third party for any portion of the Work on the Project, or any Project-related services, where that third party is, either directly or indirectly, required to exchange Electronic Documents with a party or with Engineer. Nothing herein will modify the requirements of the Contract regarding communications between and among the parties and their subcontractors and consultants.

1.2 TERMINOLOGY

A. The term “Electronic Document” is defined in Paragraph1.01.A.20 and the term “Electronic Means” is defined in Paragraph1.01.A.21 of the General Conditions.
B. The following words or terms are not defined but, when used in this Section, have the following meaning:
   1. “Confidential information” means electronic data that the transmitting party has designated as confidential and clearly marked with an indication such as “Confidential”, “Business Proprietary”, or similar designation.
   2. “Written” or “in writing” means any and all communications, including without limitation a notice, consent, or interpretation, prepared and sent to an address provided in the Contract Documents or otherwise agreed upon by the parties and Engineer using a transmission method sent forth in this Section that allows the recipient to print or store the communication. Communications transmitted electronically are presumed received when sent in conformance with this Paragraph 1.2.A.3.

1.3 ELECTRONIC DOCUMENTS

A. Transmission of Electronic Documents constitutes a warrant by the transmitting party to the receiving party that the transmitting party is one or more of the following:
   1. The copyright owner of the Electronic Document.
   2. Has permission from the copyright owner to transmit the Electronic Document for its use on the Project.
   3. Is authorized to transmit confidential information.

B. Receiving party agrees to keep confidential information confidential and not to disclose it to another person except to (1) its employees, (2) those who need to know the content of the confidential information to perform services or construction solely and exclusively for the Project, or (3) its consultants, contractors, Subcontractors, and Suppliers whose contracts include similar restrictions on the use of any Electronic Document and confidential information.

C. Transmitting party does not convey any right in any Electronic Document or in the software used to generate or transmit such data. Receiving party may not use electronic data unless permission to do so is provided in the Contract Documents, or in a separate license.

D. Unless otherwise granted in a separate license, receiving party's use, modification, or further transmission of Electronics Documents, as provided the Contract Documents, is specifically limited to the design and construction of the Project in accordance with this Section, and nothing contained in this Section conveys any other right to use the Electronic Document for any other purpose.

E. To the fullest extent permitted by Laws and Regulations, receiving party shall indemnify and defend the transmitting party from and against all claims arising from or related to receiving party's modification to, or unlicensed use of, Electronic Documents.

1.4 ELECTRONIC DOCUMENT PROTOCOL

A. Basic Requirements

1. To the fullest extent practical, the parties agree to and will transmit and accept Electronic Documents in an electronic or digital format using the procedures described in this Protocol. Use of the Electronic Documents and any information contained therein is subject to the requirements of this Protocol and other provisions of the Contract.

2. The contents of the information in any Electronic Document will be the responsibility of the transmitting party.

3. Electronic Documents as exchanged by this Protocol may be used in the same manner as the printed versions of the same documents that are exchanged using non-electronic format and methods, subject to the same governing requirements, limitations, and restrictions, set forth in the Contract Documents.

4. Nothing herein negates any obligation 1) in the Contract to create, provide, or maintain an original printed record version of Drawings and Specifications, signed and sealed according to applicable Laws and Regulations; 2) to comply with any applicable Law or Regulation governing the signing and sealing of design documents or the signing and electronic transmission of any other documents; or 3) to comply with the notice requirements of Paragraph 18.01 of the General Conditions.

B. System Infrastructure For Electronic Document Exchange

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

2. Each party is responsible for its own system operations, security, back-up, archiving, audits, printing resources, and other Information Technology ("IT") for maintaining operations of its System Infrastructure during the Project, including coordination with the party's individual(s) or entity responsible for managing its System Infrastructure and capable of addressing routine communications and other IT issues affecting the exchange of Electronic Documents.

3. Each party will operate and maintain industry-standard, industry-accepted, ISO-standard, commercial-grade security software and systems that are intended to protect the other party from: software viruses and other malicious software like worms, trojans, adware; data breaches; loss of confidentiality; and other threats in the transmission to or storage of information from the other parties, including transmission of Electronic Documents by physical media such as CD/DVD/flash drive/hard drive. To the extent that a party maintains and operates such security software and systems, it shall not be liable to the other party for any breach of system security.

4. In the case of disputes, conflicts, or modifications to the EDP required to address issues affecting System Infrastructure, the parties shall cooperatively resolve the issues; but, failing resolution, the Owner is authorized to make and require reasonable and necessary changes to the EDP to effectuate its original intent. If the changes cause additional cost or time to Contractor, not reasonably anticipated under the original EDP, Contractor may seek an adjustment in price or time under the appropriate process in the Contract.

5. Each party is responsible for its own back-up and archive of documents sent and received during the term of the contract under this EDP, unless this EDP establishes a Project document archive, either as part of a mandatory Project website or other communications protocol, upon which the parties may rely for document archiving during the specified term of operation of such Project document archive. Further, each party remains solely responsible for its own post-Project back-up and archive of Project documents after the term of the Contract, or after termination of the Project document archive, if one is established, for as long as required by the Contract and as each party deems necessary for its own purposes.

6. If a receiving party receives an obviously corrupted, damaged, or unreadable Electronic Document, the receiving party will advise the sending party of the incomplete transmission.

7. The parties will bring any non-conforming Electronic Documents into compliance with the EDP. The parties will attempt to complete a successful transmission of the Electronic Document or use an alternative delivery method to complete the communication.

8. The Owner or Engineer will operate a Project information management system (also referred to in this EDP as "Project Website") for use of Owner, Engineer and Contractor during the Project for exchange and storage of Project-related communications and information. Except as otherwise provided in this EDP or the General Conditions, use of the Project Website by the parties as described in this Paragraph will be mandatory for exchange of Project documents, communications, submittals, and other Project-related information. The following conditions and standards will govern use of the Project Website:

    a. Describe the period of time during which the Project Website will be operated and be available for reliance by the parties;

    b. Provide any minimum system infrastructure, software licensing and security standards for access to and use of the Project Website;

    c. Describe the types and extent of services to be provided at the Project Website (such as large file transfer, email, communication and document archives, etc.); and

d. Include any other Project Website attributes that may be pertinent to Contractor's use of the facility and pricing of such use.

C. Software Requirements For Electronic Document Exchange; Limitations

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

    a. Prior to using any updated version of the software required in this section for sending Electronic Documents to the other party, the originating party will first notify and receive concurrence from the other party for use of the updated version or adjust its transmission to comply with this EDP.

2. The parties agree not to intentionally edit, reverse engineer, decrypt, remove security or encryption features, or convert to another format for modification purposes any Electronic Document or information contained therein that was transmitted in a software data format, including Portable Document Format (PDF), intended by sender not to be modified, unless the receiving party obtains the permission of the sending party or is citing or quoting excerpts of the Electronic Document for Project purposes.

3. Software and data formats for exchange of Electronic Documents will conform to the requirements set forth in Exhibit A to this Section, including software versions, if listed.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 EXHIBITS

A. Exhibit A, Software Requirements for Electronic Document Exchange following this Section's "End of Section" designation, is part of this Specifications Section.

+ + END OF SECTION + +

Exhibit A - Software Requirements for Electronic Document Exchange

Item	Electronic Documents	Transmittal Means	Data Format	Note (1)
a.1	General communications, transmittal covers, meeting notices and responses to general information requests for which there is no specific prescribed form.	Email	Email	
a.2	Meeting agendas, meeting minutes, RFI's and responses to RFI's, and Contract forms.	Email w/ Attachment	PDF	(2)
a.3	Contactors Submittals (Shop Drawings, "or equal" requests, substitution requests, documentation accompanying Sample submittals and other submittals) to Owner and Engineer, and Owner's and Engineer's responses to Contractor's Submittals, Shop Drawings, correspondence, and Applications for Payment.	Email w/ Attachment	PDF	
a.4	Correspondence; milestone and final version Submittals of reports, layouts, Drawings, maps, calculations and spreadsheets, Specifications, Drawings and other Submittals from Contractor to Owner or Engineer and for responses from Engineer and Owner to Contractor regarding Submittals.	Email w/ Attachment or LFE	PDF	
a.5	Layouts and drawings to be submitted to Owner for future use and modification.	Email w/ Attachment or LFE	DWG	
a.6	Correspondence, reports and Specifications to be submitted to Owner for future word processing use and modification.	Email w/ Attachment or LFE	DOC	
a.7	Spreadsheets and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	EXC	
a.8	Database files and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	DB	

Notes	
(1)	All exchanges and uses of transmitted data are subject to the appropriate provisions of Contract Documents.
(2)	Transmittal of written notices is governed by Paragraph 18.01 of the General Conditions.

Key	
Email	Standard Email formats (.htm, .rtf, or .txt). Do not use stationery formatting or other features that impair legibility of content on screen or in printed copies
LFE	Agreed upon Large File Exchange method (FTP, CD, DVD, hard drive)
PDF	Portable Document Format readable by Adobe® Acrobat Reader Version DC or later
DWG	Autodesk® AutoCAD .dwg format Version 19.0
DOC	Microsoft® Word .docx format Version Office 2013
EXC	Microsoft® Excel .xls or .xml format Version Office 2013
DB	Microsoft® Access .mdb format Version Office 2013

SECTION 01 32 16

PROGRESS SCHEDULE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Prepare and submit Progress Schedules in accordance with the General Conditions (as may be modified by the Supplementary Conditions) and this Section, unless otherwise accepted by ENGINEER.
   2. Maintain and update Progress Schedules. Submit updated Progress Schedules as specified in this Section unless otherwise directed by ENGINEER.
   3. ENGINEER's acceptance of the Progress Schedule, and comments or opinions concerning the activities in the Progress Schedule shall not control CONTRACTOR's independent judgment relative to means, methods, techniques, sequences, and procedures of construction. CONTRACTOR is solely responsible for complying with the Contract Times.

1.2 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Progress Schedules:
      a. Submit preliminary Progress Schedule in accordance with Paragraph 2.03 of the General Conditions. Submit in accordance with Section 01 33 00, Submittal Procedures and Section 01 31 26, Electronic Document Protocol.
      b. After making revisions in accordance with ENGINEER's comments on the preliminary Progress Schedule, submit the Progress Schedule in accordance with Paragraph 2.05 of the General Conditions. Submit in accordance with Section 01 33 00, Submittal Procedures and Section 01 31 26.
      c. Submit updated Progress Schedule at each progress meeting. If a Progress Schedule remains unchanged from one progress meeting to the next, submit a written statement to that effect. For monthly Progress Schedule submittals, bring to progress meeting the number of printed copies of the updated Progress Schedule specified in Section 01 31 19.23, Progress Meetings, and formally submit in accordance with Section 01 33 00, Submittal Procedures and Section 01 31 26, Electronic Document Protocol.
      d. Furnish each Progress Schedule submittal with letter of transmittal complying with requirements of Section 01 33 00, Submittal Procedures, and specifically indicating the following:

1) Listing of activities and dates that have changed since the previous Progress Schedule submittal.
2) Discussion of problems causing delays, anticipated duration of delays, and proposed countermeasures.

2. Recovery Schedules: Submit in accordance with this Section, and other provisions of the Contract Documents.

1.3 PROGRESS SCHEDULE FORMAT AND CONTENT

A. Format:
1. Type:
2. Sheet Size: 8-1/2-inches by 14-inches or 11-inches by 17-inches, unless otherwise accepted by ENGINEER.
3. Time Scale: Indicate first date of each work week.
4. Organization:
   a. Indicate on the separate Schedule of Submittals dates for submitting and reviewing Shop Drawings, Samples, and other submittals.
   b. Group deliveries of materials and equipment into a separate sub-schedule that is part of the Progress Schedule.
   c. Group construction into a separate sub-schedule (that is part of the Progress Schedule) by activity.
   d. Group critical activities that dictate the rate of progress (the "critical path") into a separate sub-schedule that is part of the Progress Schedule. Clearly indicate the critical path on the Progress Schedule.
   e. Organize each sub-schedule by Specification Section number.
5. Activity Designations: Indicate title and related Specification Section number.

B. Content: Progress Schedules shall indicate the following:
1. Delivery dates for materials and equipment to be incorporated into the Work.
2. Dates for beginning and completing each phase of the Work by activity and by trade.
3. Dates corresponding to the Contract Times, and planned completion date associated with each Milestone (if any), Substantial Completion, and readiness for final payment.

C. Coordinate the Progress Schedule with the Schedule of Submittals.

1.4 RECOVERY SCHEDULES

A. Recovery Schedules – General:
1. When updated Progress Schedule indicates that the ability to comply with the Contract Times falls 5 or more days behind schedule, and the delay is within the control of CONTRACTOR, and there is no corresponding Change Order or Work Change Directive to support an extension of the Contract Times, CONTRACTOR shall prepare and submit a Progress Schedule demonstrating

CONTRACTOR's plan to accelerate the Work to achieve compliance with the Contract Times ("recovery schedule") for ENGINEER's acceptance.

2. Submit recovery schedule within 5 days after submittal of updated Progress Schedule where need for recovery schedule is indicated.

B. Implementation of Recovery Schedule:
   1. At no additional cost to OWNER, do one or more of the following: furnish additional resources (additional workers, additional construction equipment, increased work hours or additional shifts, and other resources), provide suitable materials, expedite procurement of materials and equipment to be incorporated into the Work, and other measures necessary to complete the Work within the Contract Times.
   2. Upon acceptance of recovery schedule by ENGINEER, incorporate recovery schedule into the next Progress Schedule update.

C. Lack of Action:
   1. CONTRACTOR's refusal, failure, or neglect to take appropriate recovery action, or to submit a recovery schedule, shall constitute reasonable evidence that CONTRACTOR is not prosecuting the Work or separable part thereof with the diligence that will ensure completion within the Contract Times. Such lack of action shall constitute sufficient basis for OWNER to exercise remedies available to OWNER under the Contract Documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements governing the following types of Submittals:

1. Action Submittals that include:
   a. Shop Drawings.
   b. Product data.
   c. Delegated design Submittals, which include documents prepared, sealed, and signed by a design professional retained by Contractor, Subcontractor, or Supplier for materials and equipment to be incorporated into the completed Work. Delegated design Submittals do not include Submittals related to temporary construction unless specified otherwise in the related Specifications Section. Delegated design Submittals include: design drawings, design data including calculations, specifications, certifications, and other Submittals prepared by such design professional.
   d. Samples.
   e. Testing plans, procedures, and testing limitations.

2. Informational Submittals that include:
   a. Certificates.
   b. Design data not sealed and signed by a design professional retained by Contractor, Subcontractor, or Supplier.
   c. Pre-construction test and evaluation reports, such as reports on pilot testing, subsurface investigations, testing for a potential Hazardous Environmental Condition, and similar reports.
   d. Supplier instructions, including installation data, and instructions for handling, starting-up, and troubleshooting.
   e. Source quality control Submittals (other than testing plans, procedures, and testing limitations), including results of shop testing.
   f. Field or Site quality control Submittals (other than testing plans, procedures, and testing limitations), including results of operating and acceptability tests at the Site.
   g. Supplier reports.
   h. Sustainable design Submittals (other than sustainable design closeout documentation).
   i. Special procedure Submittals, including plans for shutdowns and tie-ins and other procedural Submittals.

j. Qualifications statements.
k. Administrative Submittals including:
1) Progress Schedules.
2) Schedules of Submittals.
3) Schedules of Values.
4) Photographic documentation.
5) Coordination drawings, when submittal of such is required.
6) Copies of permits obtained by Contractor.
7) Field engineering reports, survey data, and similar information.

3. Closeout Submittals that include:
a. Maintenance contracts.
b. Operations and maintenance data.
c. Bonds, such as special maintenance bonds and bonds for a specific material, equipment item, or system.
d. Warranty documentation.
e. Record documentation.
f. Sustainable design closeout documentation.
g. Software.
i. Keying.

B. Not Included in this Section: Administrative and procedural requirements for following are covered elsewhere in the Contract Documents:
1. Requests for interpretations of the Contract Documents.
2. Change Orders, Work Change Directives, and Field Orders.
3. Applications for Payment
4. Reports, documentation, and permit applications required to be furnished by Contractor to authorities having jurisdiction.

C. When type of Submittal is not specified and is not included in the list above, request an interpretation from Engineer.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Scheduling
1. Provide Submittals well in advance of need for the material or equipment, or procedure (as applicable), in the Work and with ample time required for delivery of materials and equipment and to implement procedures following Engineer's approval or acceptance of the associated Submittal. Work covered by a Submittal will not be included in progress payments until approval or acceptance of related Submittals has been obtained in accordance with the Contract Documents.

2. Samples and Submittals that are related to the same element of the Work or Specifications section should be furnished at the same time. Engineer will not review Submittals without associated Samples and will not review Samples without associated Shop Drawing or product data.
   a. Samples shall clearly illustrate functional characteristics of materials, all related parts and attachments, and full range of color, texture, pattern, and materials

B. DimensionsContractor is responsible for dimensions to be confirmed and corrected at the Site; quantities; information pertaining solely to fabrication processes; means, methods, sequences, procedures, and techniques of construction; safety precautions and programs incident thereto; and for coordinating the work of all trades.

C. Representation: Contractor's signature on Submittal's stamp and letter of transmittal shall be Contractor's representation that Contractor has complied with his obligations under the Contract Documents relative to that Submittal. Engineer and Owner shall be entitled to rely on such representations by Contractor.

1.3 SCHEDULE OF SUBMITTALS

A. Timing:
1. Furnish Schedule of Submittals within time frames indicated in the Contract Documents.
2. Submit updated Schedule of Submittals with each Submittal of the updated Progress Schedule.

B. Content:
Identify on Schedule of Submittals all Submittals required in the Contract Documents. Requirements for content of preliminary Schedule of Submittals and subsequent updates of the Schedule of Submittals are identical. . Updates of Schedule of Submittals shall show scheduled dates and actual dates for completed tasks. Indicate Submittals that are on the Project's critical path. Indicate the following for each Submittal:
1. Date by which Submittal will be received by Engineer.
2. Whether Submittal will be for a substitution or "or-equal". Procedures for requesting approval of substitutes and "or-equals" are specified in the General Conditions, Section 01 25 00, Substitution Procedures.
3. Date by which Engineer's response is required. Not less than 14 days shall be allowed for Engineer's review, starting upon Engineer's actual receipt of each Submittal. Allow increased time for large or complex Submittals.
4. For Submittals for materials or equipment, date by which material or equipment must be at the Site to avoid delaying the Work and to avoid delaying the work of other contractors, if any.

C. Prepare Schedule of Submittals using same software, and in same format, specified

for Progress Schedules in Section 01 32 16, Progress Schedule.

D. Coordinate Schedule of Submittals with the Progress Schedule.

E. Schedule of Submittals that is not compatible with the Progress Schedule, or that does not indicate Submittals on the Project's critical path, or that that places extraordinary demands on Engineer for time and resources, is unacceptable. Do not include Submittals not required by the Contract Documents.

F. In preparing Schedule of Submittals:
   1) Consider the nature and complexity of each Submittal, and allow sufficient time for review and revision.
   2) Reasonable time shall be allowed for: Engineer's review and processing of Submittals, for Submittals to be revised and resubmitted, and for returning Submittals to Contractor.
   3) Identify and accordingly schedule Submittals that are expected to have long anticipated review times.

1.4 PROCEDURE FOR SUBMITTALS

A. Submittal Identification System: Use the following Submittal identification system, consisting of Submittal number and review cycle number.
   1. Submittal Number: Shall be separate and unique number correlating to each individual Submittal required. Assign Submittal numbers as follows:
      a. First part of Submittal number shall be the applicable Specifications Section number, followed by a hyphen.
      b. Second part of Submittal number shall be a three-digit number (sequentially numbered from 001 through 999) assigned to each separate and unique Submittal furnished under the associated Specifications Section.
      c. Submittal number for the third Submittal furnished for Section 40 05 19, Ductile Iron Process Pipe, would be "40 05 19-003".
   2. Review Cycle Number: Shall be a "(1)" designation indicating the initial Submittal or re-submittal associated with each Submittal number:
      a. "(2)" = Initial (first) Submittal.
      b. "(3)" = Second Submittal (e.g., first re-submittal).
      c. "(4)" = Third Submittal (e.g., second re-submittal).

3. Examples:

Example Description	Submittal Identification	
	Submittal No.	Review Cycle
Initial (first) review cycle of the third Submittal provided under Section 40 05 19, Ductile Iron Process Pipe	40 05 19-003-	(5)
Second review cycle (first re-submittal) of third Submittal provided under Section 40 05 19, Ductile Iron Process Pipe	40 05 19-003-	(6)

B. Letter of Transmittal for Submittals:
   1. Each letter of transmittal shall be for one Specifications Section.
   2. At beginning of each letter of transmittal, include a reference heading indicating: Contractor's name, Owner's name, Project name, Contract designation, transmittal number, and Submittal number.
   3. For Submittals with proposed deviations from requirements of the Contract Documents, letter of transmittal shall specifically describe each proposed variation.

C. Contractor's Review and Stamp:
   1. Contractor's Review: Before transmitting Submittals to Engineer, review Submittals to:
      a. ensure proper coordination of the Work;
      b. determine that each Submittal is in accordance with Contractor's needs;
      c. verify that Submittal contains sufficient information for Engineer to determine compliance with the Contract Documents.
   2. Incomplete or inadequate Submittals will be returned without review.
   3. Contractor's Stamp and Signature:
      a. Each Submittal furnished shall bear Contractor's stamp of approval and signature, as evidence that Submittal has been reviewed by Contractor and verified as complete and in accordance with the Contract Documents.
      b. Submittals without Contractor's stamp and signature will be returned without review. Signatures that appear to be computer-generated will be regarded as unsigned and the associated Submittal will be returned without review.

c. Contractor's stamp shall contain the following:

"Project Name: Sandy Pond Road Sanitary Sewer Rehabilitation

Contractor's Name: _____

Contract Designation: _____

Date: _____

---------- *Reference* ----------

Submittal Title: _____

Specifications:

Section: _____

Page No.: _____

Paragraph No.: _____

Drawing No.: _____ of _____

Location of Work: _____

Submittal No. and Review Cycle: _____

Coordinated by Contractor with Submittal Nos.: _____

I hereby certify that the Contractor has satisfied Contractor's obligations under the Contract Documents relative to Contractor's review and approval of this Submittal.

Approved for Contractor by: _____"

D. Submittal Marking and Organization:

1. Mark on each page of Submittal and each individual component submitted with Submittal number and applicable Specifications paragraph.
2. Arrange Submittal information in same order as requirements are written in the associated Specifications Section.
3. Each Shop Drawing sheet shall have title block with complete identifying information satisfactory to Engineer.
4. Package together Submittals for the same Specifications Section. Do not furnish required information piecemeal.

E. Format of Submittal and Recipients:

1. Action Submittals and Informational Submittals: Furnish in accordance with Table 01 33 00-A:

TABLE 01 33 00-A: SUBMITTAL CONTACTS AND REQUIRED FORMAT

	Address for Deliveries	Contact Person	E-mail Address	Format*	No. of Printed Copies
a.	Engineer: ARADIS U.S., Inc., 500 Edgewater Dr. Suite 511, Wakefield, MA, 01880	Amy Anderson	Amy.Anderson @arcadis-us.com	E	Zero
b.	Resident Project Representative: At the Site.	Cameron Jenkins	Cameron.Jenkins @arcadis-us.com	E & P	One
c.	Other Prime Contractors (addresses TBD)	TBD	TBD	E	Zero
* **Format**: E = Electronic files; P = Printed copies. TBD = To Be Determined					

2. Samples:
   a. Securely label or tag Samples with Submittal identification number. Label or tag shall include clear space at least four inches by four inches in size for affixing Engineer's review stamp. Label or tag shall not cover, conceal, or alter appearance or features of Sample. Label or tag shall not be separated from the Sample.
   b. Submit quantity of Samples required in Specifications. If quantity of Samples is not indicated in the associated Specifications Section, furnish not less than 2 identical Samples of each item required for Engineer's approval. Samples will not be returned to Contractor. If Contractor requires Sample(s) for Contractor's use, so advise Engineer in writing and furnish additional Sample(s). Contractor is responsible for furnishing, shipping, and transporting additional Samples.
   c Deliver one Sample to Engineer's field office at the Site. Deliver balance of Samples to Engineer at address indicated in Table 01 33 00-A, unless otherwise directed by Engineer.
3. Closeout Submittals:
   a. Furnish the following Closeout Submittals in accordance with Table 01 33 00-A: maintenance contracts; bonds for specific materials, equipment, or systems; warranty documentation; and sustainable design closeout documentation. On documents such as maintenance contracts and bonds, include on each document furnished original ("wet") signature of entity issuing said document. When original "wet" signatures are required, furnish such Submittals in printed form and electronic form to Engineer, and to other entities furnish as indicated in Table 01 33 00-A.
   b. Record Documentation: Submit in accordance with Section 01 78 39, Project Record Documentation.

c. Software: Submit number of copies required in Specifications Section where the software is specified. If number of copies is not specified, provide two copies on compact disc in addition to software loaded on Owner's computer(s) or microprocessor(s).

F. Electronic Submittals:
1. Format: Electronic files shall be in accordance with Section 01 31 26, Electronic Document Protocol. Files shall be electronically searchable.
2. Organization and Content:
a. Each electronic Submittal shall be one file; do not divide individual Submittals into multiple files.
b. When Submittal is large or contains multiple parts, furnish PDF file with bookmark for each section of Submittal.
c. Content shall be identical to printed Submittal. First page of electronic Submittal shall be Contractor's letter of transmittal.
3. Quality and Legibility: Electronic Submittal files shall be made from the original and shall be clear and legible. Do not submit scans of faxed copies. Electronic file shall be full size of original, printed documents. Properly orient all pages for reading on a computer screen.
5. Submitting Electronic Files:
a. Transmit electronic files in accordance with Section 01 31 26, Electronic Document Protocol.

G. Distribution:
1. Distribution of Engineer's Response via Electronic Files: Upon completion of Engineer's review, electronic Submittal response will be distributed by Engineer to:
a. Contractor.
b. Other prime contractors.
c. Owner.
d. Resident Project Representative (RPR).
e. Engineer's file.

H. Resubmittals: Refer to the General Conditions for requirements regarding resubmitting required Submittals.

1.5 ENGINEER'S REVIEW

A. Submittals not required by the Contract Documents will not be reviewed by Engineer nor be recorded in Engineer's Submittal log and the Contractor will be advised accordingly andall printed copies of such Submittals will be returned to Contractor. Electronic copies of such Submittals, if any, will not be retained by Engineer.

B. Action Submittals, Results of Engineer's Review: Each Submittal will be given one of the following dispositions by Engineer:

1. Approved: Upon return of Submittal marked "Approved", order, ship, or fabricate materials and equipment included in the Submittal (pending Engineer's approval or acceptance, as applicable, of source quality control Submittals) or otherwise proceed with the Work in accordance with the Submittal and the Contract Documents.
2. Approved as Corrected: Upon return of Submittal marked "Approved as Corrected", order, ship, or fabricate materials and equipment included in the Submittal (pending Engineer's approval or acceptance, as applicable, of source quality control Submittals) or otherwise proceed with the Work in accordance with the Submittal and the Contract Documents, and in accordance with the corrections indicated in the Engineer's Submittal response.
3. Approved as Corrected – Resubmit: Upon return of Submittal marked "Approved as Corrected – Resubmit", order, ship, or fabricate materials and equipment included in the Submittal (pending Engineer's approval or acceptance, as applicable, of source quality control Submittals) or otherwise proceed with the Work in accordance with the Submittal and the Contract Documents, and in accordance with corrections indicated in Engineer's Submittal response. Furnish to Engineer a re-submittal with all corrections made. Receipt of corrected re-submittal is required before materials or equipment covered in the Submittal will be eligible for payment.
4. Revise and Resubmit: Upon return of Submittal marked "Revise and Resubmit", make the corrections indicated and re-submit to Engineer for approval.
5. Not Approved: This disposition indicates material or equipment that cannot be approved. Upon return of Submittal marked "Not Approved", repeat initial Submittal procedure utilizing approvable material or equipment, with a complete Submittal clearly indicating all information required.

C. Informational Submittals, Results of Engineer's Review:

1. Each Submittal will be given one of the following dispositions:
    a. Accepted: Information included in Submittal complies with the applicable requirements of the Contract Documents, and is acceptable. No further action by Contractor is required relative to this Submittal, and the Work covered by the Submittal may proceed, and materials and equipment with Submittals with this disposition may be shipped or operated, as applicable.
    b. Not Accepted: Submittal does not indicate compliance with applicable requirements of the Contract Documents and is not acceptable. Revise Submittal and re-submit to indicate acceptability and compliance with the Contract Documents.

D. Closeout Submittals, Results of Engineer's Review: Dispositions and meanings are the same as specified for Informational Submittals. When acceptable, Closeout Submittals will not receive a written response from Engineer. Disposition as "accepted" will be recorded in Engineer's Submittal log. When Closeout Submittal is not acceptable, Engineer will provide written response to Contractor.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 35 14

NOTIFICATION PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Coordinate the Work with OWNER, ENGINEER, utility owners, and owners of affected private properties and provide the required notices.

1.2 NOTICES TO OWNER/ENGINEER

A. Notify the OWNER and ENGINEER in writing at least 10 days in advance of beginning any Work on Site.

B. Notify the ENGINEER in writing 1 week before marking out limits of construction, objects destined for removal, and easements.

C. Notify the ENGINEER in writing within 2 days after marking trees, bushes, and other structures or obstacles for removal, protections, or demolition.

D. Notify the OWNER and ENGINEER by telephone at least 2 days in advance of beginning any sewage bypass operations.

E. Notify Police Dispatch by telephone of the closing of any street. This notification shall include the location, start, and duration of the street closings and shall inform the dispatchers if the streets are intermittently passable or totally blocked. A contact name and phone/pager number of a responsible person at the Site shall be included with the notification.

F. Notify the ENGINEER by telephone 2 days prior to conducting any inspections.

G. Notify the ENGINEER in writing of the proposed location of any new lateral cleanout 2-4 weeks before its proposed installation.

H. Notify the ENGINEER by telephone 2 days prior to start or restart of any Work requiring inspection, including, but not limited to, excavation, backfill, piping system installation, rehabilitation Work, testing, and sampling.

I. Notify the ENGINEER in writing at the completion of all restoration activities.

1.3 NOTICES TO OTHER UTILITIES

A. Notify owners of adjacent utilities when prosecution of the Work may affect them.

B. Notify utilities and other concerned agencies at least 72 hours prior to cutting or closing streets or other traffic areas or excavating near underground utilities or pole lines.

C. CONTRACTOR shall provide seven-day written notification to the Mass Highway Department District Engineer's office before closing any State-owned road. This notification shall include the locations, start times, and durations of the street closures.

1.4 NOTICES TO PROPERTY OWNERS

A. Notify all property owners whose properties contain, are adjacent to, or whose sewer service will be impacted by the Work:
   1. Between 2 and 4 days prior to markouts of limits of construction and permanent easements, in writing.
   2. Between 2 and 4 days prior to silt fence installation, in writing.
   3. Within 2 days after marking trees, bushes, and other structures or obstacles for removal, protections, or demolition, in writing.
   4. Between 5 and 10 days prior to installation of new cleanouts, in writing. With each notification, provide a copy of the applicable agreement furnished by the OWNER.
   5. 3 days before starting multiple day sewage bypass operations at any single location, in writing.
   6. 3 days before starting sewer rehabilitation, in writing.
   7. 3 days before starting night work.
   8. Immediately prior to disruption of service or access, in writing **and** by knocking on doors of the owners or tenants of adjoining or affected property. Include the time proposed to begin any Work that will interfere with their normal passage or service and the anticipated time of return of normal access or service. Notices shall include CONTRACTOR'S name, telephone number, and the project coordinator to contact for additional information and inquiries.
   9. Immediately after return of normal service or access, in writing **and** by knocking on doors.
   10. At the completion of all restoration activities, in writing.

B. Notify all property owners whose properties are adjacent to or containing Work in writing between 2 and 8 days prior to initiating all other Work. If the phasing of the Work dictates a lull between aspects of the Work greater than 8 days, an additional notice will be required between 2 and 8 days prior to returning to work in that area.

C. If the time of Work is delayed, make additional notifications to affected properties as directed by the ENGINEER.

D. Example templates of notices will be provided by the ENGINEER. Notices shall include appropriate information concerning the Work and instructions on how to limit inconvenience caused thereby.

E. Hand deliver all written notices. Secure notices to the front door handle, or the handle of the primary door to the residence if the front door does not appear to be used, using a rubber band, door hanger, or other approved device.

1.5 SUBMITTALS

A. Submit templates of each of the above notices to ENGINEER for approval before delivery.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

+ + END OF SECTION + +

SECTION 01 35 23

SAFETY REQUIREMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section augments the requirements elsewhere in the Contract Documents regarding CONTRACTOR's responsibilities for safety and protection and includes requirements for CONTRACTOR's safety representative and other safety requirements applicable to the Project.
   2. CONTRACTOR shall provide labor, materials, tools, equipment, training, certifications, protective measures, and incidentals shown, specified, and required to comply with CONTRACTOR's obligations under the Contract for safety and protection of personnel and property.

C. Related Sections: Provisions of this Section are coordinated with, but are not limited to, the following:
   1. Section 01 41 28, Confined Space Entry Permit.
   2. Section 01 71 33, Protection of the Work and Property.

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. CONTRACTOR's Safety Representative:
      a. ENGINEER's acceptance of CONTRACTOR's safety representative's qualifications does not in any way mitigate or relieve CONTRACTOR of CONTRACTOR's safety obligations under the Contract Documents.
      b. CONTRACTOR's safety representative shall possess not less than five years of experience serving as the safety representative on projects similar to or larger in size than this Contract, and for type(s) of construction similar in nature to the Work.
      c. CONTRACTOR's safety representative shall be experienced in the types of Work to be performed under the Contract and shall be experienced with safety precautions, procedures, and equipment appropriate for the safe performance of the Work.
      d. Prior to the Effective Date of the Contract, shall have successfully completed a 30-hour OSHA Construction Safety and Health training course.
      e. CONTRACTOR's safety representative shall be completely experienced with and knowledgeable of all applicable health and safety

Laws and Regulations and with good safety practices, and shall ensure compliance with such Laws and Regulations and practices at the Site.

f. Minimum responsibilities of CONTRACTOR's safety representative are indicated in this Section.

1.3 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Emergency contact information, in accordance with Article 1.5 of this Section.
   2. Citations:
      a. Copies of safety citations from authorities having jurisdiction and insurance companies, submitted within 24 hours of CONTRACTOR's receipt of such citations.
   3. Qualifications Statements:
      a. CONTRACTOR's Safety Representative: Submit name and qualifications of CONTRACTOR's safety representative, including summary of experience, and training received and valid certifications and accreditations applicable to the Project.

1.4 SAFETY REPRESENTATIVE RESPONSIBILITIES

A. General:
   1. CONTRACTOR's safety representative shall have appropriate space at the Site to maintain and keep available safety records, up-to-date copies of pertinent safety Laws and Regulations, Material Data Sheets, CONTRACTOR's site-specific health and safety plan, copies of OWNER's health and safety requirements with which CONTRACTOR shall comply, and the Site safety plan including information concerning foreseeable emergency conditions, and emergency contact information as required in Article 1.5 of this Section.

B. CONTRACTOR's safety representative's responsibilities include:
   1. Duties and responsibilities in accordance with the General Conditions.
   2. CONTRACTOR's safety representative shall coordinate with CONTRACTOR's "competent person" required under Laws and Regulations.
   3. CONTRACTOR's safety representative shall attend progress meetings in accordance with Section 01 31 19.23, Progress Meetings.
   4. Schedule and conduct safety meetings and safety training programs as required by Laws and Regulations, CONTRACTOR's Site-specific health and safety plan (SSHASP), and good safety practices. Include in the SSHASP a specific schedule (dates) of such meetings and an outline of materials to be covered. Advise ENGINEER prior to the time and place of such meetings. Invite OWNER's personnel to meetings. Instruct CONTRACTOR's

employees (and Subcontractors, Suppliers with personnel at the Site, and others for whom CONTRACTOR is responsible) on recognition of hazards, observance of precautions, of the contents of the SSHASP and other safety programs with which CONTRACTOR shall comply, and use of personal protective equipment (PPE) and safety equipment.

5. Determine that operators of specific construction equipment (and permanent equipment used for construction operations) are qualified by training and experience before such personnel are allowed to operate such equipment.
6. Develop and implement emergency response procedures, including names, locations, and contact telephone numbers for emergency services and medical assistance as indicated in requirements for the emergency contact list in Article 1.5 of this Section.
7. Post appropriate notices regarding health and safety Laws and Regulations at locations at the Site and CONTRACTOR's office that afford maximum exposure to personnel.
8. Post appropriate instructions and warning signs in regard to all hazardous areas and hazardous conditions that cannot be eliminated. Identification of such areas shall be based on experience, site surveillance, and severity of the associated hazard. Signage shall not be used in place of appropriate workplace controls.
9. Ascertain via personal inspection that safety Laws and Regulations and safety program requirements are enforced. Make inspections at appropriate frequencies to ensure that machines, tools, and equipment are in a safe operating condition; and that all work areas are free of hazards to the extent practicable. Implement necessary and timely corrective actions to eliminate unsafe acts and unsafe conditions, and submit to ARCADIS daily copy of findings resulting from inspection, using inspection checklist forms established in CONTRACTROR's SSHASP.
10. Submit to ENGINEER copies of safety citations from authorities having jurisdiction and insurance companies within 24 hours of CONTRACTOR's receipt of such citations.
11. Provide appropriate orientation to employees, visitors, Subcontractors, and Supplier personnel at the Site.
12. Perform all related tasks necessary to achieve the highest degree of safety that the nature of the Work allows.

1.5 EMERGENCY CONTACT INFORMATION

A. CONTRACTOR shall submit list of emergency contact information for 24-hour use throughout the Project. Emergency contact information shall be updated and kept current throughout the Project. If personnel or contact information change, furnish updated emergency contact information list at the next progress meeting.

B. CONTRACTOR's list of emergency contact information shall include:
   1. CONTRACTOR's project manager's office, field office, cellular, and home telephone numbers.

2. CONTRACTOR's Site superintendent's office, field office, cellular, and home telephone numbers.
3. CONTRACTOR's foreman's field office, cellular (if available), and home telephone numbers.
4. CONTRACTOR's safety representative's office, cellular, and home telephone numbers.
5. Major Subcontractors' and Suppliers' office, cellular, and home telephone numbers of project manager and foreman (when applicable).

C. Additional Emergency Contact Information:
1. OWNER's Water and Sewer Superintendent: office, cellular, and home telephone numbers.
2. OWNER's Water and Sewer Assistant Superintendent: office, cellular, and home telephone numbers.
3. OWNER's central 24-hour emergency telephone number.
4. ENGINEER's project manager's office, cellular, and home telephone numbers.
5. ENGINEER's project engineer's office, cellular, and home telephone numbers.
6. Resident Project Representative's office, field office, cellular, and home telephone numbers.
7. Utility companies' 24-hour contact telephone number(s), including gas, water, sewer, oil, telephone, cable television/telecommunications, and other companies or concerns having utilities in the vicinity of the Work.
8. Highway and street owners' 24-hour telephone number(s).
9. Emergency telephone numbers, including: "Emergency: Dial 911", and seven-digit telephone numbers for the hospital, ambulance, police, and fire department nearest to the Site. Furnish names of each of these institutions.
10. Other involved entities as applicable.
12. Include with list of emergency contact information an 8.5-inch by 11-inch map showing route from the Site to the nearest hospital.

1.6 SAFETY EQUIPMENT

A. General:
1. CONTRACTOR shall provide proper safety and rescue equipment, adequately maintained and readily available, for any foreseeable contingency.
2. Such equipment shall include items such as safety ropes and harnesses, fall-prevention devices, stretchers, water safety devices, oxygen breathing apparatus, resuscitators, gas detectors, oxygen deficiency indicators, combustible gas detectors, fire extinguishers and first-aid equipment in accordance with the Division 01 Specifications, and similar equipment.
3. Keep safety equipment in protected areas. Check safety equipment at scheduled intervals.

B. Safety Equipment Log:

1. Maintain a log indicating the person who checked the equipment, when equipment was checked, and that equipment was acceptable.
2. Update equipment log not less-often than monthly.
3. Include in safety representative's onsite records copies of equipment calibration records.

C. Provide replacement safety equipment when primary safety equipment is unavailable due to use or when undergoing maintenance.

D. Personal Protective Equipment (PPE):
1. All persons entering the work areas shall wear appropriate PPE required for the particular area.
2. Remove from the Site any person failing to comply with this or any other safety requirement.
3. Continuously provide all necessary PPE for ENGINEER's employees, Resident Project Representative, and consultants. ENGINEER will furnish for ENGINEER's employees and consultants protective helmets (hard hats), safety eyewear, reflective vests, and hearing protection. CONTRACTOR shall furnish other equipment required.

1.7 EVACUATION DRILL

A. Included in CONTRACTOR's SSHASP shall be evacuation drills, conducted not less-often than once every six months, scheduled and conducted by CONTRACTOR under supervision of CONTRACTOR's safety representative.

B. Perform evacuation drill during regular working hours, scheduled to minimize disruption of the Work.

C. Upon evacuation, CONTRACTOR and all personnel for whom CONTRACTOR is responsible, immediately advise ENGINEER's onsite personnel and OWNER's facility manager that all personnel have been evacuated.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 41 28

CONFINED SPACE ENTRY PERMIT

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. OWNER has determined that portions of the Site may constitute confined spaces or permit-required confined spaces, as defined in this Section.
   2. CONTRACTOR shall provide appropriate measures, including labor, supervision, equipment, protective devices, and incidentals, to protect the health and safety of personnel at the Site relative to confined spaces, and who may be affected by the Work in confined spaces including, without limitation: employees and agents of CONTRACTOR, Subcontractors, Suppliers, OWNER, ENGINEER, and ENGINEER's consultants, while engaged in performance of their respective duties at Site.
   3. Comply with requirements of OWNER's confined space entry permitting program, if any.

1.2 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning:
   1. "Confined spaces" are areas on or about the Site as defined in 29 CFR 1910.146(b), 29 CFR 1926.21(b)(6), and other Laws and Regulations. Confined spaces include, but are not limited to: storage tanks, process vessels, bins, boilers and similar spaces; ventilation or exhaust ducts and stacks; manholes, underground utility vaults and chambers, sewers, pipelines, tunnels; and open-topped spaces greater than four feet deep, such as pits, tubs, vaults, and vessels.
   2. "Entry permit" means the written or printed document provided by the employer of personnel entering permit-required confined space, to allow and control entry into permit-required confined space and that contains the information specified in 29 CFR 1926.146(f), and other Laws and Regulations.
   3. "Permit-required confined space" means confined space as defined in 29 CFR 1926.146(b) and other Laws and Regulations, and that has one or more of the following characteristics:
      a. Contains or has potential to contain a hazardous atmosphere.
      b. Contains material that has potential for engulfing an entrant.
      c. Has internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or floors, or by floor that slopes downward and tapers to a smaller cross-section.
      d. Contains other recognized serious safety or health hazard.

4. "Hot work permit" means the written authorization of employer of personnel entering a confined space to perform operations, such as riveting, welding, cutting, burning, and heating, capable of providing a source of ignition.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with Laws and Regulations related to protecting personnel working in or entering confined spaces, including:
   1. Code of Federal Regulations (CFR), Title 29, Part 1910, Occupational Safety and Health Standards.
   2. CFR, Title 29, Part 1926, Safety and Health Regulations for Construction.

1.4 SUBMITTALS

A. Informational Submittals: If acceptable, written response for Informational Submittals required in this Section will not be returned to CONTRACTOR. Submit the following to OWNER; if submittals under this Section are furnished to ENGINEER, ENGINEER will forward all submittals under this Section to OWNER without review.
   1. Permits and Reports: For each time personnel enter a confined space, copies of completed permits required for confined space entry, and completed confined space data sheets, submitted upon request of OWNER.

1.5 CONFINED SPACE ENTRY PLAN

A. Prepare, maintain, and implement Site-specific confined space entry plan which shall be incorporated into CONTRACTOR's Site-specific health and safety plan. Maintain copy of the confined space entry plan at the Site for access by employees, OWNER, and authorities having jurisdiction. Confined space entry plan shall include:
   1. Results of CONTRACTOR's Site-specific hazard assessment to identify confined spaces that are permit-required confined spaces, including list of all such spaces that will be accessed for the Work. Update the list as required throughout the Project.
   2. Requirements for safeguarding access to, and restricting non-permitted personnel from accessing, permit-required confined spaces during the Project.
   3. Project-specific procedures to be followed when entering or accessing permit-required confined spaces.
   4. Documentation of training provided to each person that will enter, or work in conjunction with entry to, permit-required confined spaces
   5. Update the plan by adding copies of permits issued and records of entry to permit-required confined spaces, as required in Article 1.6 of this Section.

1.6 CONFINED SPACE SAFETY

A. Personnel entering confined space shall be trained in accordance with 29 CFR 1926.21 (b)(6), 29 CFR 1910.146(g), and other Laws and Regulations.

B. Comply with 29 CFR 1910.146, other Laws and Regulations, and requirements of authorities having jurisdiction.

C. Recordkeeping: Using the example forms attached to this Section, or other forms required by CONTRACTOR, OWNER, or authority having jurisdiction, issue for each instance of access to permit-required confined space, completed permit(s) and complete associated data sheet. File completed permits and data sheets in the Site-specific confined space entry plan, and submit in accordance with Article 1.4 of this Section. Such permits and information shall include:
   1. Permit for entry to permit-required confined space(s).
   2. Permit for hot work in permit-required confined space(s).
   3. Complete confined space data sheet.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SUPPLEMENTS

A. The example forms listed below, following this Section's "End of Section" designation, are part of this Specifications Section:
   1. "Confined Space Data Sheet" (one page).
   2. "Confined Space Entry Permit (two pages).
   3. "Confined Space Hot Work Permit" (one page).

+ + END OF SECTION + +

CONFINED SPACE DATA SHEET

Name of Confined Space Entered: _____

Location of Confined Space Entered: _____

Contractor/Subcontractor Accessing Confined Space: _____

PRE-ENTRY SYSTEM CONTROLS USED

		Check
Mechanical:	Isolate, lockout and de-energize to zero potential energy.	☐
Engulfment:	Blank/block/cap/bleed off lines. Lock out gates, valves, pumps.	☐
Electrical:	Lockout/Tag-out	☐
Inerting:	Flush/Purge/Vent	☐

Special Precautions: _____

ATMOSPHERE RESULTS

Date of Last-measured Values: _____

	Oxygen	Explosive	H_2S/Toxic	CO	Date/Time Completed	Initials
Permissible Range	19.5%-23.5%	< 10% LFL	< 10 ppm H_2S	< 35 ppm	--	--
Last Measured						
Values This Entry						

SITE AND PERSONNEL SAFETY (check if required, list type where applicable)

Personal Protective Equipment (PPE) Used:
Safety Harness ☐. Life Lines ☐. Hard Hats ☐. Fall Protection ☐. Retrieval ☐. Eye ☐. Ear ☐. Face ☐. Hand ☐. Foot ☐. Respiratory ☐ (type)_____. Clothing ☐ (type)_____
Other: ☐ _____

Rescue and Emergency Equipment On-Hand/Used:
Retrieval Equipment ☐. Fire Extinguishers ☐. Radios/Telephone ☐. Ladder ☐. Other ☐ _____
Equipment on Standby for Rescue Personnel ☐ _____

Site Safety Equipment/Items On-Hand/Used:
Explosion-Proof Lighting ☐. Barriers/Shield/Barricades ☐ (type)_____. Postings/Flagging ☐.
Other ☐ _____

_____

List specific equipment that was isolated, de-energized, and locked out.

_____

CONFINED SPACE ENTRY PERMIT

ENTRY TEAM

Contractor/Subcontractor Accessing Confined Space: _____

Site or Facility: _____

Specific Confined Space to be Entered: _____

Purpose of Entry (describe the work to be performed): _____

Date: _____ **Time:** _____ **Expected Job Duration (days/hours):** _____

Entry Supervisor: _____ **Designated Attendant:** _____

Authorized/Qualified Entrants: _____ _____

_____ _____

_____ _____

Entry Team Rotation:

Date: _____ **Time:** _____

Entry Supervisor: _____ **Designated Attendant:** _____

Authorized/Qualified Entrants: _____ _____

_____ _____

_____ _____

Entry Team Rotation:

Date: _____ **Time:** _____

Entry Supervisor: _____ **Designated Attendant:** _____

Authorized/Qualified Entrants: _____ _____

_____ _____

_____ _____

Communication Procedures:

Entry Team: _____

Standby/Rescue Personnel: _____

Sign-Offs:

Person Authorizing this Entry: _____

Entry Supervisor: _____

Person Terminating Permit:_____ **Date:** _____ **Time:** _____

Distribution to:_____ _____ _____

Attach to this permit a list of rescue and emergency services that can be summoned and the means (such as the equipment to use and the telephone numbers to call) for summoning such emergency services.

Confined Space Entry Permit (PAGE 2 of 2)

PRE-ENTRY SYSTEM CONTROL

		Check	Date/Initials
Mechanical:	Isolate, lockout and de-energize to zero potential energy.	Completed ☐	_____
Engulfment:	Blank/block/cap/bleed off lines. Lock out gates, valves, pumps.	Completed ☐	_____
Electrical:	Lockout/Tag-out	Completed ☐	_____
Inerting:	Flush/Purge/Vent	Completed ☐	_____

Special Precautions: _____

ATMOSPHERE - Tested by portable atmospheric monitor with audible and visual alarms.
No one will enter a space with an unsafe atmosphere without approval from the Contractor Superintendent.

	Oxygen	Explosive	H_2S/Toxic	CO	Date/Time Completed	Initials
Permissible Range	19.5%-23.5%	< 10% LFL	< 10 ppm H_2S	< 35 ppm	--	--
Pre-Entry						
Post Ventilation						
Continuous						
Continuous						
Continuous						

Ventilation Used (circle one): Mechanical Natural
Special Precautions: (See Confined Space Data Sheet) _____

SITE AND PERSONNEL SAFETY (check if required, list type where applicable)

Personal Protective Equipment (PPE) Required:
Safety Harness ☐. Life Lines ☐. Hard Hats ☐. Fall Protection ☐. Retrieval ☐. Eye ☐. Ear ☐. Face ☐. Hand ☐. Foot ☐. Respiratory ☐ (type) _____. Clothing ☐ (type) _____.
Other: ☐ _____

Rescue and Emergency Equipment Required:
Retrieval Equipment ☐. Fire Extinguishers ☐. Radios/Telephone ☐. Other ☐ _____.
Equipment on Standby for Rescue Personnel ☐ _____

Site Safety Equipment/Items Required:
Explosion-Proof Lighting ☐. Barriers/Shield/Barricades ☐ (type)_____. Postings/Flagging ☐.
Other ☐ _____
_____.

List specific equipment to be isolated, de-energized, and locked out.

_____

_____

CONFINED SPACE HOT WORK PERMIT

Contractor/Subcontractor Accessing Confined Space for Hot Work: _____

Site or Facility: _____

Specific Confined Space to be Entered: _____

Date: _____ **Time:** _____

Expected Job Duration (days/hours): _____

Purpose of Entry (describe the work to be done): _____

Explain Why Work Cannot be Done Outside of the Confined Space: _____

Safety Equipment Required:

Fire Extinguishers: **Yes** _____ **No** _____ **Number** _____

Type _____

Respirators: **Yes** _____ **No** _____ **Number** _____

Type _____

Other Equipment: _____

Authorizing Supervisor:

Print Name _____

Signature _____

Date Signed _____

SECTION 01 42 00

REFERENCES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Section includes the following:
      a. Definitions and terminology in general use in the Contract Documents.
      b. Applicable codes.
      c. Abbreviations in general use throughout the Contract Documents.
      d. General requirements regarding reference standards, including a listing of standard-issuing organizations (and their acronyms) used in the Contract Documents.

1.2 DEFINITIONS AND TERMINOLOGY

A. Definitions and terminology applicable to all the Contract Documents are included in the General Conditions, as may be modified by the Supplementary Conditions.

B. Additional terminology used in the Contract Documents includes the following:
   1. "Indicated" refers to graphic representations, notes, or schedules on the Drawings, or to other paragraphs, provisions, tables, or schedules in the Specifications and similar locations in the other Contract Documents. Terminology such as "shown", "noted", "scheduled", and "specified" are used to help the user locate the reference without limitation on the location.
   2. "Installer", "applicator", or "erector" is CONTRACTOR or another person or entity engaged by CONTRACTOR, either as an employee or Subcontractor, to perform a particular construction activity, including installation, erection, application, or similar Work. Installers shall be experienced in the Work that installer is engaged to perform.
      a. The term "experienced", when used in conjunction with the term "installer", means having successfully completed not less than five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated and required; being familiar with Laws and Regulations; and having complied with requirements of authorities having jurisdiction, and complying with requirements of the Supplier of the material or equipment being installed, unless other experience requirements specific to that element of the Work are indicated elsewhere in the Contract Documents.
   3. Trades: Use of terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized

individuals of a corresponding generic name, such as “carpenter”, unless otherwise indicated in the Contract Documents or required by Laws or Regulations. Such terminology also does not imply that specified requirements apply exclusively to trade personnel of the corresponding generic name.

4. “Assigned specialists” and similar terms: Certain Sections of the Specifications require that specific construction activities be performed by specialists with recognized, extensive experience in such operations. Engage said specialists for such activities, and their engagement is a requirement over which CONTRACTOR has no option. These requirements do not conflict with enforcement of building codes and other Laws and Regulations. Also, such requirements are not intended to interfere with local trade union jurisdictional settlements and similar conventions. Such assignments shall not relieve CONTRACTOR of responsibility for complying with the requirements of the Contract Documents.

1.3 APPLICABLE CODES

A. References in the Contract Documents to local code(s) shall mean the following:
   1. Town of Ayer Ordinances and Regulations

1.4 ABBREVIATIONS

A. Common abbreviations that may be found in the Contract Documents are indicated below, alphabetically by their written-out meaning:

alternating current	a-c
ampere	A
antemeridian	a.m.
Architectural Barriers Act	ABA
Americans with Disabilities Act	ADA
Americans with Disabilities Act Accessibility Guidelines	ADAAG
ante meridian	a.m.
average	avg
biochemical oxygen demand	BOD
five-day biochemical oxygen demand	BOD_5
brake horsepower	bhp
British thermal unit	Btu
building information model	BIM
carbonaceous biochemical oxygen demand	CBOD
five-day carbonaceous biochemical oxygen demand	$CBOD_5$

chemical oxygen demand		COD
Centigrade (or Celsius)		C
chlorinated polyvinyl chloride		CPVC
chlorofluorocarbons		CFC
Code of Federal Regulations		CFR
computer-aided drafting and design		CADD, or CAD
cubic inch		cu in
cubic foot		cu ft
cubic yard		cu yd, or CY
cubic feet per minute		cfm
cubic feet per second		cfs
decibel		db
degree Centigrade (or Celsius)	(Write)	degrees C, ^{o}C, or deg
degrees Fahrenheit		degrees F, ^{o}F, or deg F
diameter		dia
direct current		d-c
dollars		$
each		ea
efficiency		eff
Fahrenheit		F
feet		ft
feet per hour		fph, or ft/hr
feet per minute		fpm
feet per second		fps, or ft/min
figure		fig
flange		flg
foot-pound		ft-lb
gallon		gal
gallons per hour		gph, or gal/hr
gallons per minute		gpm
gallons per second		gps
gram		g
grams per liter		g/L
Hertz		Hz
horsepower		hp or HP
hour		hr

human-machine interface	HMI
inch	in.
inches of mercury	in. Hg
inches water gage	in. w.g.
inch-pound	in.-lb
inside diameter	ID
iron pipe size	IPS
thousand pounds	kips
thousand pounds per square inch	ksi
kilovolt-ampere	kva
kilowatt	kw
kilowatt-hour	kwhr or kwh
linear foot	lin ft or LF
liter	L
Leadership in Energy and Environmental Design (USGBC)	LEED
maximum	max
mercury	Hg
milligram	mg
milligrams per liter	mg/l or mg/L
milliliter	ml
millimeter	mm
million gallons per day	mgd or MGD
million gallon	MG
minimum	min
national pipe threads	NPT
net positive suction head	NPSH
net positive suction head available	NPSHA
net positive suction head required	NPSHR
nitrogen oxide (total concentration of mono-nitrogen oxides such as nitric oxide (NO) and nitrogen dioxide (NO_2))	NOx
nominal pipe size	NPS
number	no.
operator interface terminal	OIT
ounce	oz
ounce-force	ozf
outside diameter	OD

parts per hundred	pph
parts per million	ppm
parts per billion	ppb
polyvinyl chloride	PVC
post meridian	p.m.
pound	lb
pounds per square inch	psi
pounds per square inch absolute	psia
pounds per square inch gauge	psig
pounds per square foot	psf
process control system	PCS
programmable logic controller	PLC
revolutions per minute	rpm
second	sec
specific gravity	sp gr, or SG
square	sq
square foot	sq ft, sf, or ft^2
square inch	sq in., or in^2
square yard	sq yd, or SY
standard	std
standard cubic feet per minute	scfm
total dynamic head	TDH
totally-enclosed fan-cooled	TEFC
volt	V
volts alternating current	vac
volts direct current	vdc
volatile organic compounds	VOC

1.5 REFERENCE STANDARDS

A. Refer to Article 3 of the General Conditions, as may be modified by the Supplementary Conditions, relative to reference standards and resolving discrepancies between reference standards and the Contract Documents. Provisions of reference standards are in effect in accordance with the Specifications.

B. Copies of Standards: Each entity engaged in the Work shall be familiar with reference standards applicable to its construction activity. Copies of applicable reference standards are not bound with the Contract Documents. Where reference standards are needed for a construction activity, obtain copies of standards from the publication source.

C. Abbreviations and Names: Where reference standards, specifications, codes, manuals, Laws or Regulations, or other published data of international, national, regional or local organizations are referred to in the Contract Documents, the organization issuing the standard may be referred to by their acronym or abbreviation only. The following acronyms or abbreviations that may appear in the Contract Documents shall have the meanings indicated below. Listing is alphabetical by acronym.

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACS	American Chemical Society
ADSC-IAFD	International Association of Foundation Drilling.
AEIC	Association of Edison Illuminating Companies
AF&PA	American Forest and Paper Association
ABMA	American Bearing Manufacturers Association (formerly Anti-Friction Bearing Manufacturers Association (AFBMA))
AGMA	American Gear Manufacturers Association
AI	Asphalt Institute
AIA	American Institute of Architects
AIChE	American Institute of Chemical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALSC	American Lumber Standards Committee
AMA	Acoustical Materials Association
AMCA	Air Movement and Control Association
AMP	National Association of Architectural Metal Manufacturers, Architectural Metal Products Division
ANSI	American National Standards Institute
APA	The Engineered Wood Association

APHA	American Public Health Association
API	American Petroleum Institute
AREA	American Railway Engineering Association
ARI	Air Conditioning and Refrigeration Institute
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASNT	American Society for Non-Destructive Testing
ASQ	American Society for Quality
ASSE	American Society of Safety Engineers
ASTM	American Society for Testing and Materials
AWCI	Association of the Wall and Ceiling Industry
AWI	Architectural Woodwork Institute
AWPA	American Wood Protection Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BAAQMD	Bay Area Air Quality Management District
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association
CBMA	Certified Ballast Manufacturers Association
CDA	Copper Development Association
CEMA	Conveyor Equipment Manufacturers Association
CGA	Compressed Gas Association
CISCA	Ceilings and Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CMAA	Crane Manufacturers Association of America
CRSI	Concrete Reinforcing Steel Institute
CSI	Construction Specifications Institute
DIN	Deutsches Institut fur Normung eV (German Institute for Standardization)
DIPRA	Ductile Iron Pipe Research Association
EJCDC	Engineers Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association, Inc.
ETL	Intertek Testing Services, Inc. (formerly ETL Testing Laboratories, Inc.)

FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FM	Factory Mutual (FM Global)
FRPI	Fiberglass Reinforced Plastics Institute
FS	Federal Specification
GA	Gypsum Association
GANA	Glass Association of North America
HEW	United States Department of Health, Education and Welfare
HI	Hydraulic Institute
HMI	Hoist Manufacturers Institute
HUD	United States Department of Housing and Urban Development
IBC	International Building Code
ICC	International Code Council
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
IFI	Industrial Fasteners Institute
IRI	Industrial Risk Insurers
ISA	Instrumentation, Systems, and Automation Society (formerly Instrument Society of America)
ISO	Insurance Services Office
ISO	International Organization for Standardization
LPI	Lightning Protection Institute
MIA	Marble Institute of America
ML/SFA	Metal Lath/Steel Framing Association
MS	Military Specifications
MSS	Manufacturers' Standardization Society
MMA	Monorail Manufacturers Association
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NAPF	National Association of Pipe Fabricators, Inc.
NARUC	National Association of Regulatory Utilities Commissioners
NBHA	National Builders Hardware Association
NBS	United States Department of Commerce, National Bureau of Standards
NCMA	National Concrete Masonry Association
NEC	National Electric Code
NELMA	Northeastern Lumber Manufacturers' Association

NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NETA	International Electrical Testing Association
NFPA	National Fire Protection Association
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NHPMA	Northern Hardwood and Pine Manufacturers Association
NIST	United States Department of Commerce, National Institute of Standards and Technology
NLGA	National Lumber Grades Authority
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	National Sanitation Foundation
NSSGA	National Stone, Sand, and Gravel Association
NTMA	National Terrazzo and Mosaic Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PEI	Porcelain Enamel Institute
PFI	Pipe Fabrication Institute
PPI	Plastics Pipe Institute
PGMC	Primary Glass Manufacturers Council
PS	Product Standards Section, United States Department of Commerce
RCSC	Research Council on Structural Connections (part of AISC)
RMA	Rubber Manufacturers Association
SAE	Society of Automotive Engineers
SCAQMD	Southern California Air Quality Management District
SCPRF	Structural Clay Products Research Foundation
SCTE	Society of Cable Telecommunications Engineers
SDI	Steel Deck Institute
SDI	Steel Door Institute
SIGMA	Sealed Insulating Glass Manufacturing Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractor’s National Association
SPI	Society of the Plastics Industry
SPIB	Southern Pine Inspection Bureau

SSPC	Society for Protective Coatings
SWI	Steel Window Institute
TCNA	Tile Council of North America
TEMA	Tubular Exchanger Manufacturers Association
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
UL	Underwriters Laboratories, Inc.
USAB	United States Access Board
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
USGBC	United States Green Building Council
USGS	United States Geological Survey
USPHS	United States Public Health Service
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association
WCMA	Wood Component Manufacturers Association
WDMA	Window and Door Manufacturers Association
WEF	Water Environment Federation
WWEMA	Water and Wastewater Equipment Manufacturers Association
WWPA	Western Wood Products Association

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 51 41

TEMPORARY PUMPING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for temporary pumping in collection systems, such as sanitary sewers, combined sewers, and storm sewers.
   2. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals shown, specified, and required for temporary pumping and handling of fluids during the Project.
   3. Design and provide temporary pumping systems, including plugs, bulkheads, and line stops as required; pumps; piping, supports, and valves; temporary instrumentation and control systems; fuel and electricity as required; personnel; and appurtenances. Comply with Laws and Regulations and requirements of authorities having jurisdiction. System shall be suitable for its service and operating environment.
   3. Capacity – General:
      a. Provide temporary pumping system of necessary capacity with not less than one of the largest pumps out of service.
      b. Pay costs associated with repairing damage to property, including cleaning, caused by undersized or inadequate temporary pumping systems.
      c. ENGINEER's acceptance of temporary pumping submittals does not relieve or mitigate CONTRACTOR from responsibility for the temporary pumping system in accordance with the Contract Documents.
   4. Temporary Pumping Capacity for Collector Sewers and Larger Sewers:
      a. Required capacity of each temporary pumping system shall be determined by CONTRACTOR.
      b. Each temporary pumping system shall be adequate to convey the discharge rate conveyed through the associated permanent conduits. Temporary pumping systems shall not result in: flow back-ups into buildings or structures; overflows to storm sewers or receiving waters; or adverse effects on system of OWNER, utility owners, or owners of transportation systems (including streets and roads).
   5. Location of temporary pumping systems shall not affect OWNER's operations, utility owners, public access to streets and drives, or access to private property, unless approved by authorities having jurisdiction.
   6. Obtain ENGINEER's acceptance of each temporary pumping system submittal. Temporary pumping systems for which ENGINEER's acceptance is not obtained in advance will not be eligible for payment.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate Work that must be performed with or before Work specified in this Section.
   2. Written Notice to Property Owners and Occupants:
      a. Provide written notice delivered to property owners and occupants of each building and structure that will be affected by temporary pumping.
      b. Deliver written notices thirty days, seven days, and one day prior to starting temporary pumping.
      c. Each such written notice shall include: estimated start and end days and times that permanent pipe or conduit will be temporarily out of service; and instructions for building or structure occupants during the outage.

C. Related Sections:
   1. Section 33 01 30.16, Television Inspection of Sewers
   2. Section 33 01 30.41, Cleaning of Sewers
   3. Section 33 01 30.43, Removal of Protruding Service Connections
   4. Section 33 01 30.61, Packer Injection Grouting
   5. Section 33 01 30.65, Pressure Testing of Sewer Pipe Joints and Tap Connections
   6. Section 33 01 30.72, Cured-in-Place Pipe Lining – Steam Cured
   8. Section 33 01 30.73, Cured-in-Place Pipe Lining – UV Cured
   9. Section 33 01 30.74, Cured-in-Place Lateral Liner
   10. Section 33 01 30.81, Manhole Rehabilitation
   11. Section 33 31 71, Sanitary Sewer Service Reconnections

1.2 QUALITYASSURANCE

A. Qualifications:
   1. Temporary Pumping System Supplier:
      a. Supplier shall have not less than five years of experience providing temporary pumping systems similar in size or larger than those required for the Project.
      b. Upon request, submit evidence of providing not less than five temporary pumping systems on other projects similar in size (or larger) and similar in service to temporary pumping systems required for the Project.

B. Component Supply and Compatibility:
   1. Obtain each temporary pumping system from a single Supplier who shall be responsible for providing a complete system.

1.3 SUBMITTALS

A. Timing: Furnish to ENGINEER submittals for temporary pumping system not less than 30 days prior to delivery of temporary pumping system to the Site.

B. Informational Submittals: Submit the following:

1. Draft Notification Letter: Draft of typical notice letters for property owners and occupants of buildings and structures.
2. Schedule for Temporary Pumping in Collection System:
    a. Schedule for temporary pumping for each work area. Include dates of mobilizing each temporary pumping system, testing, starting and ending dates of temporary pumping, and demobilizing each temporary pumping system in each work area.
    b. At CONTRACTOR's option, such information may be included on the Progress Schedule prepared and maintained in accordance with Section 01 32 16, Progress Schedule. When such option is exercised, however, upon request of ENGINEER break out as separate sub-schedule the schedule of temporary pumping in collection system and furnish to ENGINEER.
    c. Maintain and update schedule for temporary pumping for collection system, and submit updated schedules in accordance with requirements for updating the Progress Schedule as indicated in Section 01 32 16, Progress Schedule.
3. Temporary Pumping Submittal: Submit the following for each temporary pumping system:
    a. Basis for capacity of the system proposed.
    b. System curve of flow plotted against total dynamic head, and calculations that substantiate the proposed temporary pumping system, including comparison of net positive suction head required and net positive suction head available.
    c. Manufacturer's data and specifications on each type and size of pump proposed and its capacity, including pump curves.
    d. Manufacturer's data and specifications for engines and other equipment required for temporary pumping system, including expected exhaust emissions data.
    e. Technical information and specifications on noise controls for noise-emitting equipment.
    f. Technical data on temporary piping, pipe joints, valves, pipe supports, controls, flow meter, secondary containment for fuel tanks, emissions controls when required, and other information pertinent to the temporary pumping system.
    g. Layout Drawings:
        1) Sketches showing proposed layout of temporary pumping system, including locations of temporary plugs, bulkheads, and line stops, suction and discharge locations, location of the pumps and associated piping and valves, and source of power and fuel (as applicable) for temporary pumping system. Sketches shall be scale drawings acceptable to ENGINEER, and shall include site plans similar to those in the Contract Documents.
        2) Details of system suction and discharge locations. Discharge details shall include measures to protect the receiving structure and dissipate energy of the pumped fluid.

3) Where it is necessary to bury temporary piping, submit trench details for buried temporary piping, including temporary surfacing proposed for traveled areas. Submit sketches and information on other types of protection proposed for temporary piping. Obtain approvals of owners of surfaces that will be disturbed by burying temporary pumping.

h. Temporary Plugs, Bulkheads, and Line Stops: Manufacturer's literature and fabrication drawings showing type of plug, bulkhead or line stop as applicable, materials, and hydrostatic head the plug, bulkhead, or line stop is designed to withstand. Submit complete technical information for CONTRACTOR-proposed line stops, installation procedures, name of proposed line stop installer, and documentation of experience on at least five similar projects.

i. Narrative describing proposed operation of temporary pumping system, including who will operate system, staffing, planned frequency of fueling, contingency plan in event of pump failure, and statement of existing systems that may be affected during operation of temporary pumping system.

4. Qualifications Statements:
   a. Submit qualifications of temporary pumping system Supplier.

PART 2 – PRODUCTS

2.1 TEMPORARY PUMPING SYSTEM

A. General:
   1. System components shall be suitable for continuous operation with the fluid pumped.
   2. Noise Controls: Provide noise controls for temporary pumping system. Noise emitted from temporary pumping system shall comply with Laws and Regulations and shall not exceed 70 db at a distance of thirty feet from noise source.
   3. Fuel-consuming temporary pumping system components intended for use when CONTRACTOR is not present shall include fuel tanks sized for not less than 24 hours of uninterrupted operation at system's operating capacity, and means to automatically notify CONTRACTOR upon high and low suction water level and low fuel level.
   4. Pumps shall be self-priming type or submersible electric, in good working order, with working pressure gauge. All power must be supplied by the CONTRACTOR. All pumps used must be constructed to allow dry running for extended periods of time.
   5. CONTRACTOR shall provide stand-by pumps of adequate capacity.

B. Instrumentation and Controls:

1. Controls: Provide controls for temporary pumping system to maintain suction structure liquid level that does not result in flow backups and that does not adversely affect OWNER's system and private property.

C. Temporary Piping System:
   1. Durable hoses in good condition and suitable for system pressures can be used where accepted by ENGINEER.
   1. Piping shall be steel, ductile iron, high density polyethylene, or other material accepted by ENGINEER and suitable for system operating pressures. Aluminum piping and PVC piping not mechanically restrained are not allowed. Durable hoses can be used only for short sections upon acceptance by ENGINEER.
   2. Piping system shall have watertight joints of the following types: fused joints, restrained couplings, flanged coupling adapters, quick-connects by Camlok or equal, flanged joints, grooved and shouldered end-type couplings, and other watertight joints accepted by ENGINEER.
   3. Size discharge piping for flow velocity of not greater than 10 feet per second.
   4. Provide check valves or pump control valves as required.
   5. Provide air valves on discharge piping as required. Air valves shall expel air upon pipe filling and admit air upon pipe dewatering, and release small quantities of entrained air during operation. Air valves shall be suitable for service with the pumped fluid.
   6. Discharge from temporary pumping system shall not adversely affect collection system structures, pipe or conduits, OWNER's operations, private property, and shall not result in flow backups, flooding, or damage. Provide energy-dissipating measures at discharge point as necessary.

D. Temporary Plugs, Bulkheads, and Line Stops:
   1. Acceptable temporary plugs and bulkheads include inflatable dams specifically designed for such service, brick bulkheads, timber bulkheads, sandbags, and other bulkhead methods suitable for the service and conduit conditions. Line stops, when required, are specified in Division 40 of the Contract Documents.
   2. Each plug, temporary bulkhead, and line stop shall be suitable for the maximum pressure encountered.
   3. Where temporary plugs and bulkheads are under pressure or surcharged, provide either two plugs or a plug and temporary bulkhead.

PART 3 – EXECUTION

3.1 PREPARATION

A. General:
   1. Provide written notice delivered to owners and occupants of each building and structure affected by temporary pumping.

2. Temporary piping shall be located off of roads, driveways, and sidewalks. Piping shall not be located in environmentally-sensitive areas such as wetlands.
3. Hydrostatic Testing of Temporary Piping System:
    a. Perform successful hydrostatic testing of temporary piping system using clean water at pressure equal to 1.2 times highest expected system operating pressure, for 15 minutes while maintaining test pressure within 3.0 psi of required test pressure.
    b. ENGINEER will witness hydrostatic test.
    c. Hydrostatic test criteria for acceptance: No leakage.
4. Verify that entire temporary pumping system is ready for operation before commencing temporary pumping. Verify that controls and flow meter are properly connected and functional.

3.2 TEMPORARY PUMPING

A. During Operation of the Temporary Pumping System:
    1. Temporary pumping system shall operate continuously. In the event of equipment failure, immediately make repairs or replace equipment. Provide spare parts and redundant units as necessary for continuous operation.
    2. In the event of accidental spill or overflow, immediately stop the discharge and take action to clean up, disinfect the spill and promptly notify the OWNER,
    3. High flow conditions may require the CONTRACTOR to temporarily suspend work. Days on which work has been suspended shall not be considered working days and no additional compensation will be provided by the OWNER.
    4. Provide personnel to monitor, operate, and maintain temporary pumping system 24 hours per day when system is in service.

3.3 DEMOBILIZATION

A. Upon Conclusion of Temporary Pumping:
    1. Remove plugs, bulkheads, and line stops in manner that allows flow to slowly return to normal, without surging, surcharging, and adverse effects on existing system.
    2. Flush out temporary pumping system with clean water discharged to an appropriate location.
    3. Remove temporary pumping system and appurtenances from the Site.
    4. When CONTRACTOR has obtained permit(s) for temporary pumping from authorities having jurisdiction, furnish written notice to such authorities that temporary pumping has been completed.

+ + END OF SECTION + +

SECTION 01 55 26

MAINTENANCE AND PROTECTION OF TRAFFIC

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall keep all roads, streets, and traffic ways open for passage of traffic and pedestrians during the Work, unless otherwise approved by owner of the street, traffic way, or right-of-way, as applicable.

B. Coordination:
   1. Coordinate with owner of the highway or street right-of-way, as applicable, for maintenance and protection of traffic requirements.
   2. Give required advance notice to fire departments, police departments, and other emergency services as applicable of proposed construction operations.
   3. Give reasonable notice to owners or tenants of private property who may be affected by construction operations. Give such notice not less than 7 days prior to when such property will or may be affected by construction operations.
   4. Coordinate with requirements of the following:
      a. Section 01 71 33, Protection of the Work and Property, regarding temporary barriers.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 GENERAL PROVISIONS

A. When required to cross, obstruct, or temporarily close a street or traffic way, provide and maintain suitable bridges, detours, or other acceptable temporary expedient for the accommodation of traffic. Closings shall be for shortest duration practical, and passage shall be restored immediately after completion of filling and temporary paving or bridging.

B. Temporary Control Devices:
   1. Provide temporary signs, signals, barricades, flares, lights and other equipment, services, and personnel required to regulate and protect traffic and warn of hazards.

2. Such Work shall comply with requirements of OWNER and authorities having jurisdiction at the Site.
3. Remove temporary equipment and facilities when no longer required, and restore grounds to condition indicated in the Contract Documents; if not indicated, resort to pre-construction conditions.

C. Keep accessible for use permanent facilities such as hydrants, valves, fire alarm boxes, postal boxes, delivery service boxes, and other facilities that may require access during construction.

3.2 TRAFFIC SIGNALS AND SIGNS

A. Provide and operate temporary traffic controls and directional signals required to direct and maintain an orderly flow of traffic in areas under CONTRACTOR's control, and areas affected by construction operations.

B. Provide temporary traffic controls and directional signs, mounted on temporary barriers or standard posts, at the following locations:
1. Each change of direction of a roadway and at each crossroad.
2. Detours and areas of hazard.
3. Parking areas.
4. Traffic entrance to and exit from each construction area.

3.3 UNIFORMED POLICE OFFICERS

A. General:
1. Provide uniformed police officers when construction operations encroach on traffic lanes, as required for regulating traffic and in accordance with requirements of authority having jurisdiction.
2. The CONTRACTOR shall make all arrangements with the Ayer Chief of Police for the services of Uniformed Police Officers.
3. The Town of Ayer Chief of Police will assign Uniformed Police Officers from his department in the quantity and at the location(s) as determined to be necessary by the Chief of Police and as Uniformed Police Officers are available.

B. Payment:
1. The OWNER shall pay for all Uniformed Police Officers in the amount invoiced by the Chief of Police. CONTRACTOR shall keep detailed records of Uniformed Police Officers used during the work, including dates, hours and names of the officers. Records shall be forwarded to OWNER each week.

3.4 FLARES AND LIGHTS

A. During periods of low visibility provide temporary flares and lights for the following:
1. To clearly delineate traffic lanes, to guide traffic, and to warn of hazardous areas.

2. For use by traffic control personnel directing traffic.

B. Provide adequate illumination of critical traffic and parking areas.

3.5 PARKING CONTROL

A. Control CONTRACTOR-related vehicular parking at the Site to preclude interfering with: traffic and parking, access by emergency vehicles, OWNER's and facility manager's operations, and construction operations. Provide temporary parking facilities for the public, as required because of construction operations.

B. Control parking of construction and private vehicles at the Site as follows:
   1. Maintain free vehicular access to and through parking areas.
   2. Prohibit parking on or adjacent to access roads, and in non-designated areas.
   3. Construction vehicles shall possess current vehicle registration.
   4. Private vehicles shall park only in designated areas.

3.6 HAUL ROUTES

A. Consult with authorities having jurisdiction to establish thoroughfares that will be used as haul routes and Site access.

B. Confine construction traffic to designated haul routes.

C. Provide temporary traffic controls at critical areas of haul routes to expedite traffic flow, and to minimize interference with normal traffic.

3.7 REMOVAL

A. Maintain and protect traffic until Substantial Completion and at all times thereafter when CONTRACTOR is working at the Site. Provide maintenance and protection of traffic measures at the Site until no longer required due to the progress of the Work. When no longer required, completely remove maintenance and protection of traffic measures and restore the Site to condition required by the Contract Documents or, when not indicated in the Contract Documents, to pre-construction conditions.

+ + END OF SECTION + +

SECTION 01 57 05

TEMPORARY CONTROLS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide and maintain methods, materials, equipment, and temporary construction as required for controlling environmental conditions at the Site and adjacent areas during construction.
   2. Maintain controls until no longer required. Provide temporary controls at all times when CONTRACTOR is working at the Site.
   3. Temporary controls include, but are not limited to, the following:
      a. Erosion and sediment controls.
      b. Noise controls.
      c. Dust controls.
      d. Pest and rodent controls.
      e. Control of water, including storm water runoff.
      f. Pollution controls.

1.2 NOTIFICATIONS

A. The ENGINEER will notify the CONTRACTOR in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the CONTRACTOR in writing, through the ENGINEER, of any non-compliance with state or local requirements. The CONTRACTOR shall, after receipt of such notice from the ENGINEER or from the regulatory agency through the ENGINEER, immediately take corrective action. Such notice, when delivered to the CONTRACTOR or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the CONTRACTOR fails or refuses to comply promptly, the OWNER may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or excess costs or damages by the CONTRACTOR unless it is later determined that the CONTRACTOR was in compliance.

1.3 QUALITY ASSURANCE

A. CONTRACTOR shall comply with all laws, rules, regulations, ordinances and requirements of the governing authorities pertaining to noise control, dust control, soil erosion and sediment control, pollution control and all other environmental controls, protection and restoration.

B. All costs incurred in complying with the laws, rules, regulations, ordinances and requirements of the governing authorities pertaining to environmental controls, protection and restoration shall be included in the prices bid for the Contract, and at no additional cost to OWNER.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Plan for construction staging and maintenance of the Site relative to erosion and sediment controls. Indicate on a site plan approximate areas of planned disturbance of soils and soil cove over time during the Project. For areas not indicated in the Contract Documents as being disturbed and that CONTRACTOR proposes to disturb, Shop Drawing shall include proposed erosion and sediment control measures for the additional area.
      b. Location and details of temporary settlement basin(s).
   2. Product Data:
      a. Silt fencing materials.

B. Informational Submittals: Submit the following:
   1. Procedural Submittals:
      a. Proposed dust control measures, when submittal is requested by ENGINEER.

PART 2 – PRODUCTS

2.1 MATERIALS FOR TEMPORARY EROSION AND SEDIMENT CONTROLS

A. General:
   1. Materials utilized for temporary erosion and sediment controls shall be in accordance with the applicable regulatory requirements indicated in Article 1.3 of this Section, unless otherwise shown or indicated in the Contract Documents.

B. Silt Fencing:
   1. Filter Cloth:
      a. Products and Manufacturers: Provide one of the following:
         1) Contech “Silt Fence”.
         2) Hanes Geo Components “Silt Fence”.
         3) Atlantic Construction Fabrics (ACF) Environmental “Silt Fence”.
         4) Or equal.
      b. Height: Two feet, minimum.
      c. Securely fasten filter cloth to wire mesh using ties spaced at maximum intervals of two feet on centers at top and mid-height of wire mesh.

2. Wire Mesh: Support filter cloth with wire mesh complying with the following:
    a. Woven wire mesh, 14-gauge steel wire, maximum mesh size six-inch by six-inch.
    b. Height: To match filter cloth height.
    c. Fasten wire mesh to fence supports with wire ties or staples.
3. Fence Support Posts:
    a. Length: Not less than three feet.
    b. Material: Metal or other acceptable material with "U", “T”, or "I" cross section, or hardwood measuring not less than 1.25-inch by 1.25-inch in cross-section.

C. Straw Bale Dike.
1. Bales shall be firmly-packed, unrotted straw bound firmly with baling wire. Cross-sectional area on the small end of each bale shall be approximately 12 inches by 12 inches or larger.
2. Posts shall comply with requirements for silt fencing support posts, or may be suitable reinforcing steel rods.

D. Mulch Materials and Soil Stabilization.
1. Mulch shall be unrotted straw or salt hay.
2. Soil stabilization emulsions, when used, shall be an inert, eco-friendly chemical manufactured for the specific purpose of erosion control and soil stabilization, applied with mulch or stabilization fibers.
3. Wood-fiber or paper-fiber, when used, shall be 100 percent natural and biodegradable.
4. Erosion control mat or netting shall be biodegradable. Acceptable materials include jute, excelsior, straw or coconut fiber, and cotton.

E. Protection of Storm Water Drainage Inlets and Catch Basins:
1. Inlet Filter Bag:
    a. Product and Manufacturer: Provide one of the following for each drainage inlet or catch basin to be protected:
        1) Atlantic Construction Fabrics (ACF) Environmental, “Silt Sack”.
        2) Mutual Industries, Inc. “Silt Sack”.
        3) Or equal.
    b. Inlet filter bag permeability shall be not less than 40 gallons per square foot of bag area exposed to the flow. Fabric shall be woven polypropylene with double stitching to prevent bursting.
    c. Inlet filter bags shall:
        1) Fit inside the drainage inlet or catch basin and shall be secured by the structure's grate or by other acceptable means.
        2) Have means of removing inlet filter bag and the silt and sediment collected therein without dumping filter bag's contents into the drainage inlet or catch basin.

F. Temporary Settlement Basin.

1. Embankment Material: Comply with requirements for general fill.
2. Provide outfall structure consisting of overflow weir and discharge pipe, and provide emergency spillway.
3. Overflow Weir and Discharge Pipe: Suitably-sized piping of corrugated metal, high-density polyethylene, or other suitable material. Pipe may be new or used; if used, pipe shall be in good condition.

G. Filter Bag on Dewatering Pump Discharge:
1. Provide filter bag on discharge of each dewatering pump drawing from an excavation. Filter bag is not required on pumps associated with dewatering wells.
2. Products and Manufacturers: Provide one of the following:
   a. UltraTech Dewatering Bag, by Interstate Products.
   b. Filter Bag, by US Fabrics.
   c. Dewatering (Filter) Bag, by Indian Valley Industries.
   d. DirtBag, by Atlantic Construction Fabrics (ACF) Environmental
   e. Or equal.
3. Size filter bags for maximum flow of the pump. Filter bags shall be specifically fabricated for use as a dewatering pump filter bag.
4. Provide sufficient spare filter bags for continuous dewatering operations.

H. Temporary Stone Construction Entrance:
1. Stone: Tough, hard, durable stone complying with the following gradation requirements:

Sieve Size	Total Percent Passing
Four-inch (100 mm)	100
3.5-inch (90 mm)	90 to 100
2.5-inch (65 mm)	25 to 60
1.5-inch (37.5 mm)	Zero to 15

.
2. Geotextile Separation Fabric: As recommended by geotextile manufacturer for separating stone from subgrade, for the vehicle weight and traffic frequency required.

PART 3 – EXECUTION

3.1 NOISE CONTROL

A. Noise Control – General:
1. CONTRACTOR's vehicles and equipment shall minimize noise emissions to greatest degree practicable. When necessary, provide mufflers and silencers on construction equipment, and provide temporary sound barriers onsite when necessary.
2. Noise levels shall comply with Laws and Regulations, including OSHA requirements and local ordinances.

3. Noise emissions shall not interfere with the work of OWNER, or others.

3.2 DUST CONTROL

A. Dust Control – General:
   1. Control objectionable dust caused by CONTRACTOR's operation of vehicles and equipment, clearing, demolition, cleaning, and other actions. To minimize airborne dust, apply water or use other methods subject to acceptance of ENGINEER and approval of authorities having jurisdiction.
   2. CONTRACTOR shall prevent blowing and movement of dust from exposed soil surfaces and access roads to reduce onsite and off-Site damage, nuisances, and health hazards associated with dust emissions.

B. Dust Control Methods:
   1. Dust control may be achieved by irrigation in which the dust-prone area of the Site shall be sprinkled with water until the surface is moist.
   2. Apply dust controls as frequently as required without creating nuisances such as excessive mud and ponding of water at the Site. Do not use water for dust control when water will cause hazardous or objectionable conditions such as ice, mud, ponds, and pollution.
   3. Provide dust control that is non-polluting and does not contribute to tracking-out of dirt and dust onto pavement.

C. Removal of Dust and Dirt from Travelled Surfaces:
   1. Remove dust and dirt from roadways, drives, parking areas, and other travelled surfaces not less than the frequency indicated in Section 01 74 05, Cleaning.
   2. Perform dust and dirt removals from travelled surfaces by mechanical sweeping or other method acceptable to ENGINEER.

3.3 PEST AND RODENT CONTROL

A. Pest and Rodent Control – General:
   1. Provide pest and rodent controls as required to prevent infestation of the Site and storage areas.
   2. Employ methods and use materials that do not adversely affect conditions at the Site or on adjoining properties.
   3. In accordance with Laws and Regulations, promptly and properly dispose of pests and rodents trapped or otherwise controlled.

3.4 WATER CONTROL

A. Water Control – General:
   1. Provide methods to control surface water and water from excavations and structures to prevent damage to the Work, the Site, and adjoining properties.
   2. Control fill, grading, and ditching to direct water away from excavations, pits, tunnels and other construction areas and to direct drainage to proper runoff

courses to prevent erosion, damage, or nuisance. Avoid directing to adjoining properties runoff from the Site and construction operations.

B. Equipment and Facilities for Water Control:
   1. Provide, operate, and maintain equipment and facilities of adequate size to control surface water.

C. Discharge and Disposal:
   1. Dispose of storm water and ground water in manner to prevent flooding, erosion, and other damage to any and all parts of the Site and adjoining areas, and that complies with Laws and Regulations.

3.5 POLLUTION CONTROL

A. Pollution Control – General:
   1. Provide means, methods, and facilities required to prevent contamination of soil, water, and atmosphere caused by discharge of noxious substances from or caused by construction operations.
   2. Equipment used during construction shall comply with Laws and Regulations.

B. Spills and Contamination:
   1. Provide equipment and personnel to perform emergency measures required to contain spills and to remove contaminated soils and liquids.
   2. Excavate contaminated material and properly dispose of off-Site, and replace with suitable compacted fill and topsoil.

C. Protection of Surface Waters and Ground Water:
   1. Provide and maintain special measures to prevent harmful substances from entering surface waters and ground water. Prevent disposal of wastes, effluents, chemicals, and other such substances in or adjacent to surface waters and open drainage routes, in sanitary sewers, or in storm sewers, and in ground water.

D. Atmospheric Pollutants:
   1. Provide and maintain systems for controlling atmospheric pollutants related to the Work.
   2. Prevent toxic concentrations of chemicals and vapors.
   3. Prevent harmful dispersal of pollutants into atmosphere.

E. Solid Waste:
   1. Provide and maintain systems for controlling and managing solid waste related to the Work.
   2. Prevent solid waste from becoming airborne, and from discharging to surface waters and drainage routes.
   3. Properly handle and dispose of solid waste.

3.6 EROSION AND SEDIMENT CONTROLS

A. Installation and Maintenance of Erosion and Sediment Controls – General:
   1. General:
      a. Provide temporary erosion and sediment controls as shown and indicated on the Drawings and as indicated elsewhere in the Contract Documents. Provide erosion and sediment controls as the Work progresses into previously-undisturbed areas.
      b. Installation of erosion and sediment controls shall be in accordance with the applicable regulatory requirements indicated in Article 1.3 of this Section, unless more-stringent methods are otherwise shown or indicated in the Contract Documents.
      c. Use necessary methods to successfully control erosion and sedimentation, including ecology-oriented construction practices, vegetative measures, and mechanical controls. Use best management practices (BMP) in accordance with Laws and Regulations, and regulatory requirements indicated in Article 1.3 of this Section, to control erosion and sedimentation during the Project.
      d. Plan and execute construction, disturbances of soils and soil cover, and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation. Provide temporary measures for controlling erosion and sedimentation, as indicated in the Contract Documents and as required for the Project.
      e. Where areas must be cleared for storage of materials or equipment, or for temporary facilities, provide measures for regulating drainage and controlling erosion and sedimentation, subject to the ENGINEER'S approval.
      f. Provide erosion and sediment controls, including stabilization of soils, at the end of each workday.
   2. Coordination:
      a. Coordinate temporary erosion and sediment controls with construction of permanent drainage facilities and other Work to the extent necessary for economical, effective, and continuous erosion and sediment controls.
   3. Before commencing activities that will disturb soil or soil cover at the Site, provide all erosion and sediment control measures required by the Contract Documents for the areas where soil or soil cover will be disturbed.
   4. Vegetation Removal: Remove only those shrubs, grasses, and other vegetation that must be removed for construction. Protect remaining vegetation.
   5. Access Roads and Parking Areas: When possible, access roads and temporary roads and parking shall be located and constructed to avoid adverse effects on the environment. Provide measures to regulate drainage, avoid erosion and sedimentation, and minimize damage to vegetation.
   6. Earthwork and Temporary Controls:

a. Perform excavation, fill, and related operations as required.
b. Control erosion to minimize transport of silt from the Site into existing waterways and surface waters. Such measures shall include, but are not limited to, using berms, silt fencing, baled straw silt barriers, gravel or crushed stone, mulching and soil stabilization, slope drains, and other methods. Apply such temporary measures to erodible materials exposed by activities associated with the construction of the Project.
c. Hold to a minimum the areas of bare soil exposed at one time.
d. Construct fills and waste areas by selectively placing fill and waste materials to eliminate surface silts and clays that will erode.
e. In performing earthwork, eliminate depressions that could serve as mosquito breeding pools.
f. CONTRACTOR shall provide special care in areas with steep slopes, where disturbance of vegetation shall be minimized to maintain soil stability.

7. Inspection and Maintenance:
   a. Periodically inspect areas of earthwork and areas where soil or soil cover are disturbed to detect evidence of the start of erosion and sedimentation; promptly implement corrective measures as required to control erosion and sedimentation. Continue inspections and corrective measures until soils are permanently stabilized and permanent vegetation has been established
   b. Repair or replace damaged erosion and sediment controls within 24 hours of CONTRACTOR becoming aware of such damage.
   c. Periodically remove silt and sediment that has accumulated in or behind sediment and erosion controls. Properly dispose of silt and sediment.
8. Duration of Erosion and Sediment Controls:
   a. Maintain erosion and sediment controls in effective working condition until the associated drainage area has been permanently stabilized.
   b. Maintain erosion and sediment controls until the Site is restored and site improvements including landscaping, if any, are complete with underlying soils permanently stabilized.
9. Work Stoppage:
   a. If the Work is temporarily stopped or suspended for any reason, CONTRACTOR shall provide additional temporary controls necessary to prevent environmental damage to the Site and adjacent areas while the Work is stopped or suspended.
10. Failure to Provide Adequate Controls:
    a. In the event CONTRACTOR repeatedly fails to satisfactorily control erosion and sedimentation, OWNER reserves the right to employ outside assistance or to use OWNER's own forces for erosion and sediment control.
    b. Cost of such work by OWNER, plus engineering and inspection costs, will be deducted from amounts due CONTRACTOR, as set-offs in accordance with the Contract Documents.

B. Silt Fencing:

1. Install and maintain silt fencing in a vertical plane, at the location(s) shown or indicated in the Contract Documents and where required.
2. Locations of Silt Fencing:
   a. Where possible, install silt fencing along contour lines so that each given run of silt fencing is at the same elevation.
   b. On slopes, install silt fencing at intervals that do not exceed the maximum intervals indicated in the following table:

Slope (percent)	Maximum Length of Slope Above Each Silt Fence (feet)
2 and less	150
2.1 to 5	100
5.1 to 10	50
10.1 to 20	25
20.1 to 25	20
25.1 to 40	15
40.1 to 50	10

   c. Provide silt fencing around perimeter of each stockpile of topsoil, general fill material, and excavated material. Install silt fencing before expected precipitation and maintain until stockpile is removed.
   d. Do not install silt fencing at the following types of locations:
      1) Area of concentrated storm water flows such as ditches, swales, or channels.
      2) Where rock or rocky soils prevent full and uniform anchoring of silt fencing.
      3) Across upstream or discharge ends of storm water piping or culverts.
3. Installation:
   a. Securely fasten wire mesh to posts, and securely fasten filter cloth to wire mesh.
   b. When two sections of filter cloth abut each other, fold over edges and overlap by not less than six inches and securely fasten to wire mesh.
   c. Embed posts in the ground to the depth necessary for proper controls; embed posts to not less than 16 inches below ground.
   d. Filter cloth and wire mesh shall extend not less than eight inches below ground and not less than 16 inches above ground.
   e. Remove sediment accumulated at silt fencing as required. Repair and reinstall silt fencing as required.
4. Maintenance:
   a. Do not allow formation of concentrated storm water flows on slopes above silt fencing unless so shown or indicated in the Contract Documents. If unauthorized concentrated storm water flows occur, stabilize the slope via earthmoving and other stabilization measures as required to prevent flow of concentrated storm water flows toward silt fencing.

C. Straw Bale Dike.

1. Install straw bale dikes where shown or indicated, including in swales, along contours, and along toe of slopes.
2. Install straw bales in shallow excavation as wide as the bale and approximately four to six inches below surrounding grade.
3. Ends of straw bales shall tightly abut ends of adjacent straw bales.
4. Securely install straw bales using two support posts per straw bale, driven into the ground not less than 1.5 to two feet below bottom of straw bale. Top of post shall be flush with top of straw bale. Angle first post for each straw bale toward the previously-installed straw bale.
5. Frequently inspect straw bales and repair or replace as required. Remove accumulated silt and debris from behind straw bales.

D. Mulching and Soil Stabilization:
   1. Use mulching to temporarily stabilize exposed soil and fill material.
      a. Immediately following final grading, provide mulch and stabilize with mats or netting, or sprayed soil stabilization emulsion with fiber additive.
      b. Application of mulching for soil stabilization shall be as follows.
         1) Unrotted Straw or Salt Hay: 1.5 to two tons per acre.
         2) Soil stabilization emulsions, when used, shall be applied in accordance with manufacturer's instructions, and shall be applied with mulch or stabilization fibers.
         3) Wood-fiber or Paper-fiber Application: 1,500 lbs. per acre, installed by hydroseeding.
      c. Where mats or netting are used:
         1) Cover entire area to be stabilized with mats or netting.
         2) Provide anchoring trenches at the top and bottom of slopes to receive mats or netting. Bury at least the top and bottom ends of mat or netting, four inches or more wide, at top and bottom of slope. Tamp trench full of soil. Four inches from trench, secure mat or netting with appropriate staples spaced at intervals of 10 inches.
         3) Overlap adjacent strips of mat or netting by not less than four inches.

E. Protection of Storm Water Drainage Inlets and Catch Basins:
   1. Protect each drainage inlet and catch basin that has the potential to receive storm water runoff from exposed soils, and does not discharge into a storm water settlement basin.
   2. Install inlet filter bags inside of drainage inlet or catch basin in accordance with manufacturer's instructions. Secure inlet filter bag with the structure's grate or by other acceptable means.
   3. Inlet filter bags shall not pose any obstruction above the pre-construction elevation of the drainage inlet or catch basin grate requiring barricades or flashers.
   4. When removing silt and sediment from inlet filter bag, do not dump filter bag's contents into the drainage inlet or catch basin.
   5. Remove silt and sediment from inlet filter bag, or replace inlet filter bag, when inlet filter bag is not more than half full.

F. Temporary Settlement Basin:
   1. For constructing embankments comply with standard construction requirements.
   2. Overflow Weir and Discharge Pipe:
      a. Install piping in accordance with manufacturer's instructions.
      b. Install overflow weirs at elevations shown or indicated on the Drawings or approved Shop Drawings, as applicable, to avoid overtopping and overfilling of settlement basin without short-circuiting the settlement basin's hydraulic performance.
      c. Wrap and secure geotextile material specified for silt fencing around discharge structures of temporary settlement basins
   3. Crushed Stone and Riprap: Install in accordance with standard construction requirements on earthwork, fill, and riprap. Provide in areas of temporary settlement basin subject to erosion, and at upstream and downstream ends of discharge piping.
   4. Remove sediment when required based on accumulation of material.
   5. When temporary settlement basin is no longer required, remove the temporary settlement basin discharge weir, discharge piping, and spillway, fill the temporary settlement basin to required grade.

G. Filter Bag on Dewatering Pump Discharge:
   1. Provide dewatering of excavations as required.
   2. Locate filter bags and temporary pump discharge lines to avoid interfering with the public, use of private property, and OWNER's and facility manager's operations. Relocate filter bags and appurtenances when required.
   3. Filter bag discharge shall be directed to appropriate storm water drainage route. Do not discharge into roadways, driveways, access roads, parking areas, or overland. When temporary settlement basin is used, locate filter bags to discharge to temporary settlement basin when practicable.
   4. Provide filter bag on discharge of each dewatering pump drawing from an excavation.
   5. Securely attach filter bag to pump discharge pipe or hose.
   6. Maintain, clean out, and replace filter bags as required.

3.7 REMOVAL OF TEMPORARY CONTROLS

A. Removals – General:
   1. Upon completion of the Work, remove temporary controls and restore Site to specified condition; if condition is not specified, restore Site to pre-construction condition.
   2. After soils are permanently stabilized, remove from the Site temporary erosion and sediment controls.

+ + END OF SECTION + +

SECTION 01 57 33

SECURITY

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall safely guard all the Work, the Project, materials, equipment, and property from loss, theft, damage, and vandalism until Substantial Completion, unless otherwise agreed upon by the parties.
   2. CONTRACTOR's duty includes safely guarding OWNER's property in vicinity of the Work and Project, and other private property in the vicinity of the Project from injury and loss in connection with performance of the Project.
   3. CONTRACTOR shall employ watchmen as required to provide required security and prevent unauthorized entry.
   4. Costs for security required under this Section shall be paid by CONTRACTOR.
   5. CONTRACTOR shall make no claim against OWNER for damage resulting from trespass.
   6. Remedy damage to property of OWNER and others arising from failure to furnish adequate security.
   7. Provide temporary fencing in accordance with the Contract Documents.
   8. CONTRACTOR's security measures shall be at least equal to those usually provided by OWNER or facility manager to protect existing facilities during normal operation.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 71 33

PROTECTION OF THE WORK AND PROPERTY

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for safety and protection that augment the requirements of the General Conditions, as may be modified by the Supplementary Conditions. This Section also includes requirements for barricades and warning signals, and protection of trees and plants, existing structures, floors, roofs, installed items, and landscaping.
   2. CONTRACTOR shall be responsible for taking all precautions, providing all programs, and taking all actions necessary to protect personnel health and safety, and to protect the Work and all public and private property and facilities from damage, as specified in the General Conditions, Supplementary Conditions, and the Specifications.
   3. To prevent damage, injury, or loss, CONTRACTOR's actions shall include the following:
      a. Provide measures for safety of personnel at the Site, including workers engaged in the Work, delivery personnel, testing and inspection personnel, personnel of authorities having jurisdiction, other visitors to the Site, the public, OWNER's personnel, facility manager's personnel (if different from OWNER), ENGINEER, and Resident Project Representative (if any).
      b. Storing apparatus, materials, supplies, and equipment in an orderly, safe manner that does not unduly interfere with progress of the Work or work of other contractors, utility owners, and owners of transportation rights-of-way.
      c. Providing suitable storage facilities for materials and equipment subject to damage or degradation by exposure to climate, temperature, theft, breakage, or other cause.
      d. Placing upon the Work or any part thereof only loads consistent with the safety and integrity of that portion of the Work and existing construction.
      e. Frequently removing and disposing of refuse, rubbish, scrap materials, and debris caused by CONTRACTOR's operations so that, at all times, the Site is safe, orderly, and workmanlike in appearance.
      f. Providing temporary barricades, fencing, and guard rails around the following: openings, scaffolding, temporary stairs and ramps, around excavations, for elevated walkways, and other areas that may present a fall-hazard or hazard to vehicles.

4. Do not, except after written consent from proper parties, enter or occupy privately-owned property or premises with personnel, tools, materials or equipment, except on lands and easements provided by OWNER.
5. CONTRACTOR has full responsibility for preserving public and private property and facilities on and adjacent to the Site. Direct or indirect damage done by, or on account of, any act, omission, neglect, or misconduct by CONTRACTOR in executing the Work, shall be remedied by CONTRACTOR, at his expense, to condition equal to that existing before damage was done.
6. Owner May Remedy:
    a. Should CONTRACTOR fail to protect and safeguard property and the Work after requests from ENGINEER or OWNER, OWNER may implement measures to protect property and the Work.
    b. Cost of such OWNER-implemented measures shall be paid by CONTRACTOR. OWNER may deduct from payments due CONTRACTOR such amounts as set-offs in accordance with the Contract Documents.
    c. Such right, however, shall not result in any obligation by OWNER or ENGINEER to continuously monitor or have responsibility for protection of property and the Work, which responsibility is exclusively CONTRACTOR's.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 BARRICADES AND WARNING SIGNALS

A. Barricades and Warning Signals – General:
    1. Where the Work is performed on or adjacent to roadway, access road or driveway, right-of-way, or public place:
        a. Provide temporary barricades, fences, lights, warning signs, danger signals, watchmen, and take other precautionary measures for protecting persons, property, and the Work.
        b. Use appropriately colored and reflective barricades, or paint barricades accordingly, to be visible at night.
        c. From sunset to sunrise, provide and maintain not less than one temporary light at each barricade.
        d. Erect sufficient barricades to keep vehicles from being driven on or into Work under construction.
        e. Furnish watchmen in sufficient numbers to protect the Work.
    2. Provide temporary barricades to protect personnel and property for Work not in or adjacent to transportation routes and vehicular travel areas, including indoor work, in accordance with Laws and Regulations.

3. CONTRACTOR's responsibility for maintaining temporary barricades, signs, lights, and for providing watchmen shall continue until the Work is substantially complete in accordance with the Contract Documents, unless other provision for security and protection is agreed to by the parties. After Substantial Completion, protect Work and property during periods when final Work or corrective Work is underway.

3.2 TREE AND PLANT PROTECTION

A. Tree and Plant Protection – General:
   1. Protect existing trees, shrubs, and plants on or adjacent to the Site, shown or designated to remain in place, against unnecessary cutting, breaking, damage, or skinning of trunk, branches, bark, and roots.
   2. Do not store materials or equipment or park construction equipment and vehicles within foliage drip lines.
   3. In areas subject to traffic, provide temporary fencing or temporary barricades to protect trees and plants.
   4. Open fires are not allowed onsite.
   5. Within the limits of the Work, water trees and plants that are to remain to maintain their health during construction operations.
   6. Cover exposed roots with burlap, and keep such burlap continuously wet. Cover exposed roots with earth as soon as possible. Protect root systems from mechanical damage and damage by erosion, flooding, runoff, and noxious materials in solution.
   7. If branches or trunks are damaged, prune branches immediately and protect cut or damaged areas with emulsified asphalt compounded specifically for horticultural use, in manner acceptable to ENGINEER.
   8. When directed by ENGINEER, remove and dispose of at location away from the Site damaged trees and plants that die or suffer permanent injury, and replace each damaged tree or plant with specimen of equal or better species and quality.

3.3 PROTECTION OF EXISTING STRUCTURES

A. Underground Facilities:
   1. Underground Facilities known to OWNER and ENGINEER, except water, gas, sewer, electric, and communications services to individual buildings and properties, are shown. Information shown for Underground Facilities is the best available to OWNER and ENGINEER but, in accordance with the General Conditions, as may be modified by the Supplementary Conditions, is not guaranteed to be correct or complete.

2. CONTRACTOR shall explore ahead of trenching and excavating Work and shall sufficiently uncover Underground Facilities that will or may interfere with the Work to determine their location, to prevent damage to Underground Facilities, and to prevent service interruption to structures and properties served by Underground Facilities. If CONTRACTOR damages an Underground Facility, CONTRACTOR shall restore it to its pre-construction condition, in accordance with requirements of the owner of the damaged facility and the Contract Documents.
3. Necessary changes in the location of the Work may be directed by ENGINEER to avoid Underground Facilities not shown or indicated on the Contract Documents.
4. If permanent relocation of an existing Underground Facilities is required and is not otherwise shown or indicated in the Contract Documents, CONTRACTOR may be directed in writing to perform the required work. When such relocation Work results in a change in the Contract Price, Contract Times, the associated Contract modification procedures and payment for such Work shall be in accordance with the Contract Documents.

B. Surface Structures:
1. Surface structures are existing buildings, structures, and other facilities at or above ground surface, including their foundations and any extension below ground surface. Surface structures include, but are not limited to, buildings, tanks, walls, bridges, roads, dams, channels, open drainage routes, exposed piping and utilities, poles, exposed wires, posts, signs, markers, curbs, walks, fencing, and other facilities visible at or above ground surface.
2. Existing surface facilities, including but not limited to guard rails, posts, guard cables, signs, poles, markers, curbs, and fencing, that are temporarily removed to facilitate the Work shall be replaced and restored to their pre-construction condition at CONTRACTOR's expense.

C. Protection of Underground Facilities and Surface Structures:
1. CONTRACTOR shall sustain in their places and protect from direct or indirect injury all Underground Facilities and surface structures located within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure or facility.
2. Before proceeding with the Work of sustaining and supporting such structure or facility, CONTRACTOR shall satisfy ENGINEER that methods and procedures to be used have been approved by party owning same.
3. CONTRACTOR shall bear all risks attending the presence or proximity of all Underground Facilities and surface structures within or adjacent to limits of the Work, in accordance with the Contract Documents.

4. CONTRACTOR shall be responsible for damage and expense for direct or indirect injury, caused by CONTRACTOR's activities, to structures and facilities. CONTRACTOR shall promptly repair damage caused by CONTRACTOR's activities, to the satisfaction of owner of damaged structure or facility.
5. Protection of Underground Facilities Under Roads and Parking Areas: Provide temporary, heavy-duty steel roadway plates to protect existing manholes, handholes, valve boxes, vaults, and other Underground Facilities near to or visible at the ground surface.

3.4 PROTECTION OF INSTALLED MATERIALS, EQUIPMENT, AND LANDSCAPING

A. Protect installed Work to prevent damage from subsequent operations. Remove protective items when no longer needed, prior to Substantial Completion of the Work.

B. Control traffic to prevent damage to equipment, materials, and surfaces.

C. Coverings:
1. Provide temporary coverings to protect materials and equipment from damage.
2. Cover projections, wall corners and jambs, sills, and soffits of openings, in areas used for traffic and for passage of materials and equipment in subsequent work.

+ + END OF SECTION + +

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall perform cutting and coring, and rough and finish patching of holes and openings in existing construction.
   2. Cutting, coring, rough patching, and finish patching shall be by CONTRACTOR.
   3. Provide cutting, coring, fitting and patching, including attendant excavation and fill, required to complete the Work, and to:
      a. Remove and replace defective Work;
      b. Remove samples of installed Work as specified or required for testing;
      c. Remove construction required to perform required alterations or additions to existing construction;
      d. Uncover the Work for ENGINEER's observation of covered Work, testing or inspection by testing entities, or observation by authorities having jurisdiction;
      e. Connect to completed Work not performed in proper sequence;
      f. Remove or relocate existing utilities and piping that obstruct the Work in locations where connections are to be made;
      g. Make connections or alterations to existing or new facilities.
   3. Structural Elements: Do not cut or patch structural elements in manner that would change structural element's load-carrying capacity as load deflection ratio.
   4. Operating Elements: Do not cut or patch operating elements in manner that would reduce their capacity to perform as intended. Do not cut or patch operating elements or related components in manner that would increase maintenance requirements or decrease operational life or safety.

1.2 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Cutting and Patching Request:
      a. Submit written request to ENGINEER, well in advance of executing cutting or alteration that affects one or more of the following:
         1) Design function or intent of Project.
         2) Work of OWNER or other contractors.
         3) Structural value or integrity of an element of the Project.
         4) Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.

5) Efficiency, operational life, maintenance, or safety of operational elements.
6) Visual qualities of sight-exposed elements.

b. Request shall include:
1) Identification of Project and Contract designation.
2) Description of affected Work of CONTRACTOR and work of others (if any).
3) Necessity for cutting.
4) Effect on work or operations of OWNER, other contractors (if any), and on structural or weatherproof integrity of Project.
5) Description of proposed Work, describing: scope of cutting and patching; trades who will be executing the Work; materials and equipment to be used; extent of refinishing; schedule of operations; alternatives to cutting and patching, if any, and net effect on aesthetics following completion of finishing Work.
6) Designation of entity responsible for cost of cutting and patching, when applicable.
7) Written permission of other prime contractors (if any) whose work will or may be affected.

2. Recommendation Regarding Cutting and Patching:
a. Should conditions of work or schedule indicate a change of materials or methods, submit written recommendation to ENGINEER including:
1) Conditions indicating change.
2) Recommendations for alternative materials or methods.
3) Items required with request for approval of substitute, in accordance with the substitution request requirements of the Contract Documents.

3. Product Data:
a. Submit manufacturer's data for the protective compound to be applied to core-drilled surfaces and cut concrete surfaces.
b. When not required under other Sections, submit manufacturer's data on materials to be used for finishing around the cut or patched area.
c. Furnish submittals for patching materials under the associated Specifications Section.

B. Informational Submittals: Submit the following:
1. Written Notification of Cutting and Patching:
a. Submit written indication designating the day and time that the construction associated with cutting and patching will be uncovered to allow for observation. Do not begin cutting or patching operations until submittal is accepted by ENGINEER.

2. X-ray Investigations:
a. Proposed method of investigation. Submit and obtain ENGINEER's acceptance prior to performing X-ray inspections.
b. Report of X-ray evaluation of slabs, floors, and walls to be cut or core-drilled.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials - General:
   1. Use materials that comply with the Contract Documents.
   2. If not shown or indicated in the Contract Documents, use materials that are identical to existing materials affected by cutting and patching Work.
   3. For exposed surfaces, use materials that visually match existing adjacent surfaces to fullest extent possible. If identical materials are unavailable or cannot be used, use materials whose installed performance will equal or surpass that of existing materials.
   4. Replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, using materials that do not void required or existing warranties.

B. Compound Applied to Core-Drilled Surfaces and Cut Concrete Surfaces:
   1. After core-drilling and before installing the utility or equipment through the penetration, coat exposed concrete and steel with solvent-free, two-component, protective, epoxy resin coating.
   2. Color shall approximate the finish color of the existing surface to be coated.
   3. Product and Manufacturer: Provide one of the following:
      a. Sikagard 62, by Sika Corporation.
      b. Or equal.

PART 3 – EXECUTION

3.1 GENERAL

A. Perform cutting and coring in such manner that limits extent of patching required.

B. Structural Elements:
   1. Do not cut or patch structural elements in manner that would change the element's structural load-carrying capacity as load deflection ratio.

C. Operating Elements:
   1. Do not cut or patch operating elements in manner that would reduce their capacity to perform as intended.
   2. Do not cut or patch operating elements or related components in manner that would increase maintenance requirements or decrease operational life or safety.

D. Replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, using methods that do not void required or existing warranties.

3.2 INSPECTION

A. Examine surfaces to be cut or patched, and conditions under which cutting or patching will be performed before starting cutting or patching Work.

B. Report unsatisfactory or questionable conditions to ENGINEER in writing. Do not proceed with cutting or patching Work until unsatisfactory conditions are corrected.

3.3 PREPARATION

A. Provide temporary support required to maintain structural integrity of facilities, to protect adjacent work from damage during cutting, and to support the element(s) to be cut.

B. Protection of Existing Construction during Cutting and Patching:
   1. Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project and facility that will be exposed during cutting and patching operations.
   2. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
   3. Do not cut existing pipe, conduit, ductwork, or other utilities serving facilities scheduled to be removed or relocated until provisions have been made to bypass them.

3.4 CORING

A. Use core-drilling to make penetrations through concrete and masonry walls, slabs, or arches, unless otherwise accepted by ENGINEER in writing.

B. Coring:
   1. Perform coring with non-impact rotary tool using diamond core-drills. Size holes for pipe, conduit, sleeves, equipment or mechanical seals, as required, to be installed through the penetration.
   2. Do not core-drill through electrical conduit or other utilities embedded in walls or slabs without approval of ENGINEER. To extent possible, avoid cutting reinforcing steel in slabs and walls.

C. Protection:
   1. Protect existing equipment, utilities, and adjacent areas from water and other damage caused by or resulting from core-drilling operations.
   2. After core-drilling and before installing the utility or equipment through the penetration, coat exposed concrete and steel with protective coating material indicated in Paragraph 2.1.B of this Section. Apply protective coating in accordance with manufacturer's instructions.

D. Cleaning:
   1. After core-drilling, vacuum or otherwise remove slurry and tailings from the work area.

3.5 CUTTING

A. Cutting – General:
   1. Cut existing construction using methods least-likely to damage elements retained and adjoining construction and that provide proper surfaces to receive subsequent installation or repair.
   2. In general, use hand tools or small power tools suitable for sawing or grinding. When possible, avoid using hammering and avoid chopping.
   3. Cut holes and slots as small as possible, neatly to the size required, and with minimum disturbance of adjacent surfaces.
   4. Prior to starting cutting, provide adequate bracing of area to be cut.
   5. To avoid marring existing finished surfaces, cut or drill from exposed or finished side into concealed side.
   6. Provide equipment of adequate size to remove the cut panel or "coupon".
   7. Provide temporary covering over cut openings where not in use.

B. Cutting – Concrete and Masonry:
   1. Cut through concrete and masonry using concrete wall saw with diamond saw blades.
   2. On both of the element being cut, provide for control of slurry generated during sawing.
   3. After cutting concrete and before installing subsequent construction on or through the opening, coat exposed concrete and steel with protective coating material indicated in Paragraph 2.1.B of this Section. Apply protective coating in accordance with manufacturer's instructions.

3.6 PATCHING

A. Patching – General:
   1. Patch construction by filling, repairing, refinishing, closing-up, and similar operations following performance of other Work.
   2. Patch with durable seams that are as inconspicuous as possible. Provide materials and comply with installation requirements indicated in the Contract Documents.
   3. Patch to provide airtight and watertight connections to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
   4. Where feasible, test patched areas to demonstrate integrity of installation.

B. Restoration:
   1. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in manner that eliminates evidence of patching and refinishing.
   2. For continuous surfaces, refinish to nearest intersection.

3. For an assembly, refinish the entire unit that was patched.
4. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 CLEANING

A. Cleaning and Restoration:
   1. Clean areas and spaces where cutting, coring, or patching were performed.
   2. Clean piping, conduit, and similar constructions before applying paint or other finishing materials.
   3. Restore damaged coverings of pipe and other utilities to original condition.

+ + END OF SECTION + +

SECTION 01 74 05

CLEANING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for keeping the Site free of accumulations of waste materials during construction ("progress cleaning") and cleaning for Substantial Completion and prior to final inspection (collectively, "closeout cleaning").
   2. CONTRACTOR shall perform cleaning during the Project, including progress cleaning, upon completion of the Work, and as required by the General Conditions, as may be modified by the Supplementary Conditions, and this Section.
   3. Maintain in a clean manner the Site, the Work, and areas adjacent to or affected by the Work.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. NFPA 241, Safeguarding Construction, Alteration, and Demolition Operations.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PROGRESS CLEANING

A. General:
   1. Clean the Site, work areas, and other areas occupied by CONTRACTOR not less than weekly. Dispose of materials in accordance with the General Conditions, as may be modified by the Supplementary Conditions, and the following:
      a. Comply with NFPA 241 for removing combustible waste materials and debris.
      b. Do not hold non-combustible materials at the Site more than three days if the temperature is expected to rise above 80 degrees F. When temperature is less than 80 degrees F, dispose of non-combustible materials within seven days of their generation.
      c. Provide suitable containers for storage of waste materials and debris.

d. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately.

B. Site:
1. Keep outdoor, dust-generating areas wetted down or otherwise control dust emissions.
2. Not less than weekly, brush-sweep roadways and paved areas at the Site that are used by construction vehicles or otherwise affected by construction activities.
3. Comply with dust control requirements of Section 01 57 05, Temporary Controls.

C. Work Areas:
1. Clean areas where the Work is in progress to maintain the extent of cleanliness necessary for proper execution of the Work.
2. Remove liquid spills promptly. Immediately report spills to OWNER, ENGINEER, and authorities having jurisdiction, in accordance with the Contract Documents and Laws and Regulations.
3. Where dust would impair proper execution of the Work, broom-clean or vacuum entire work area, as appropriate.
4. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

D. Installed Work:
1. Keep installed Work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of material or equipment installed, using only cleaning agents and methods specifically recommended by material or equipment manufacturer. If manufacturer does not recommend specific cleaning agents or methods, use cleaning agents and methods that are not hazardous to health and property and that will not damage exposed surfaces.

E. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration until Substantial Completion.

F. Cutting and Patching:
1. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, trailings and cuttings, and similar materials.
2. Thoroughly clean piping, conduits, and similar features before applying patching material, paint, or other finishing materials. Restore damaged coverings on piping, ducting, and similar items to its pre-construction condition.

G. Waste Disposal:
1. Properly dispose of waste materials, surplus materials, debris, and rubbish off the Site.

2. Do not burn or bury rubbish and waste materials at the Site.
3. Do not discharge volatile or hazardous substances, such as mineral spirits, oil, or paint thinner, into storm sewers or sanitary sewers.
4. Do not discharge wastes into surface waters or drainage routes.
5. CONTRACTOR is solely responsible for complying with Laws and Regulations regarding storing, transporting, and disposing of waste generated by CONTRACTOR's operations or brought to the Site by CONTRACTOR.

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

I. Clean completed construction as frequently as necessary throughout the construction period.

3.2 CLOSEOUT CLEANING

A. Complete the following prior to requesting inspection for Substantial Completion:
1. Clean and remove from the Site rubbish, waste material, debris, and other foreign substances.
2. Sweep paved areas broom-clean. Remove petrochemical spills, stains, and other foreign deposits.
3. Hose-clean sidewalks and loading areas.
4. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
5. Leave surface waterways, drainage routes, storm sewers, and gutters open and clean.
6. Repair pavement, roads, sod, and other areas affected by construction operations and restore to specified condition; if condition is not specified, restore to pre-construction condition.
7. Clean exposed exterior and interior hard-surfaced finishes to dirt-free condition, free of spatter, grease, stains, fingerprints, films, and similar foreign substances.
8. Clean, wax, and polish wood, vinyl, and painted floors.
9. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, and similar spaces.
10. In unoccupied spaces, sweep concrete floors broom-clean.
11. Clean transparent materials, including mirrors and glazing in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
12. Remove non-permanent tags and labels.
13. Surface Finishes:
    a. Touch-up and otherwise repair and restore chipped, scratched, dented or otherwise marred surfaces to specified finish and match adjacent surfaces.

b. Do not paint over “UL” or similar labels, including mechanical and electrical nameplates.

14. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint, and mortar droppings, and other foreign substances.
15. Clean plumbing fixtures to sanitary condition, free of stains, including stains resulting from water exposure.
16. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
17. Clean lighting fixtures, lamps, globes, and reflectors to function with full efficiency. Replace temporary lamps provided in permanent fixtures. Replace existing lighting fixture components that are burned out or noticeably dimmed from use during construction. Replace defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
18. Leave the Site clean, and in neat, orderly condition, satisfactory to OWNER and ENGINEER.

+ + END OF SECTION + +

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall provide all labor, materials, equipment, and services to maintain and submit to ENGINEER project record documents in accordance with the Contract Documents.

B. Maintenance of Record Documents:
   1. Maintain in CONTRACTOR's field office, in clean, dry, legible condition, complete sets of the following record documents: Drawings, Specifications, and Addenda; Shop Drawings, Samples, and other CONTRACTOR submittals, including records of test results, approved or accepted as applicable, by ENGINEER; Change Proposals, Proposal Requests, Change Orders, Work Change Directives, Field Orders, copies of all interpretations and clarifications issued, photographic documentation, survey data, and all other documents pertinent to the Work.
   2. Provide files and racks for proper storage and easy access to record documents. File record documents in accordance with the latest edition of the Construction Specification Institute's *MasterFormat*™ used for organizing the Project Manual, unless otherwise accepted by ENGINEER.
   3. Promptly make record documents available for observation and review upon request of ENGINEER or OWNER.
   4. Do not use record documents for any purpose other than serving as Project record. Do not remove record documents from CONTRACTOR's field office without ENGINEER's approval.

1.2 SUBMITTALS

A. Closeout Submittals: Submit to the ENGINEER the following:
   1. Record Documents:
      a. Submit the following Project record documents:
         1) Drawings.
         2) Project manual including Specifications and Addenda (bound).
      b. Prior to readiness for final payment, submit to ENGINEER one copy of Project's final record documents and obtain ENGINEER's acceptance of same. Submit complete record documents; do not make partial submittals.
      c. Submit both printed record documents and electronic record documents, in accordance with Section 01 31 26, Electronic Document Protocol.

d. Submit record documents with transmittal letter on CONTRACTOR letterhead in accordance with requirements in Section 01 33 00, Submittal Procedures.

2. Certifications:
   a. Record documents submittal shall include certification, with original signature of official authorized to execute legal agreements on behalf of CONTRACTOR, reading as follows:

> "[*Insert CONTRACTOR's corporate name*] has maintained and submitted Project record documentation in accordance with the General Conditions and Supplementary Conditions, Section 01 78 39, Project Record Documents, and other elements of Contract Documents, for the Town of Ayer, Massachusetts, Department of Public Works. We certify that each record document submitted is complete, accurate, and legible relative to the Work performed under our Contract, and that the record documents comply with the requirements of the Contract Documents.
>
> [*Provide signature, print name, print signing party's corporate title, and date*]"

1.3 RECORDING CHANGES

A. Recording Changes – General:
   1. At the start of the Project, label each record document to be submitted as, "PROJECT RECORD" using legible, printed letters. Letters on record copy of the Drawings shall be two inches high.
   2. Keep record documents current consistent with the progress of the Work. Make entries on record documents within two working days of receipt of information required to record the change.
   3. Do not permanently conceal the Work until required information has been recorded for Project record documents.
   4. Accuracy of record documents shall be such that future searches for items shown on the record documents may rely reasonably on information obtained from ENGINEER-accepted record documents.
   5. Marking of Entries:
      a. Use erasable, colored pencils (not ink or indelible pencil) for marking changes, revisions, additions, and deletions to record documents.
      b. Clearly describe the change by graphic line and make notations as required. Use straight-edge to mark straight lines. Writing shall be legible and sufficiently dark to allow scanning of record documents into legible electronic files in portable document format (".PDF").
      c. Date each entry on record documents.
      d. Indicate changes by drawing a "cloud" around the change(s) indicated.
      e. Mark initial revisions in red. In the event of overlapping changes, use different colors for subsequent changes.

B. Drawings:
   1. Record changes on copy of the Drawings. Submittal of CONTRACTOR-originated or -produced drawings as a substitute for recording changes on a copy of the Drawings is unacceptable.
   2. Record changes on plans, sections, elevations, schematics, schedules, and details as required for clarity, making reference dimensions and elevations (to Project datum) for complete record documentation.
   3. Record actual construction including:
      a. Depths of various elements of foundation relative to Project datum.
      b. Horizontal and vertical location of Underground Facilities referenced to permanent surface improvements and project elevation datum. For each Underground Facility, including pipe fittings, show and indicate dimensions to not less than two permanent, visible surface improvements.
      c. Location of exposed utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure and, where applicable, to Project elevation datum.
      d. Changes in structural and architectural elements of the Work, including changes in reinforcing.
      e. Field changes of dimensions, arrangements, and details.
      f. Changes made in accordance with Addenda, Change Orders, Work Change Directives, and Field Orders.
      g. Changes in details on the Drawings. Submit additional details prepared by CONTRACTOR when required to document such changes.
   4. Recording Changes for Schematic Layouts:
      a. Where arrangements of conduits, circuits, piping, ducts, and similar items are shown schematically and are not intended to portray physical layout the final physical arrangement shall be determined by CONTRACTOR subject to acceptance by ENGINEER.
      b. Record on the Project record documents all revisions to schematics on the Drawings, including: piping schematics, ducting schematics, process and instrumentation diagrams, control and circuitry diagrams, electrical one-line diagrams, motor control center layouts, and other schematics when included in the Drawings. Show and indicate actual locations of equipment, lighting fixtures, in-place grounding system, and other pertinent data.
      c. When dimensioned plans and dimensioned sections or elevations on the Drawings show the Work schematically, indicate on the record documents, by dimensions accurate to within one inch in the field, centerline location of items of Work such as conduit, piping, ducts, and similar items
         1) Clearly identify each item of the Work by accurate notations such as “cast iron drain”, “rigid electrical conduit”, “copper waterline”, and similar descriptions.

2) Show by symbol or by note the vertical location of each item of the Work; for example, “embedded in slab”, “under slab”, “in ceiling plenum”, “exposed”, and similar designations. For piping not embedded, also indicate elevation dimension relative to Project elevation datum.
3) Descriptions shall be sufficiently detailed to be related to the Specifications.

d. ENGINEER may furnish written waiver of requirements relative to schematic layouts shown on plans, sections, and elevations when, in ENGINEER’s judgment, dimensioned layouts of Work shown schematically will serve no useful purpose. Do not rely on such waiver(s) being issued.

5. Supplemental Drawings:
   a. In some cases, drawings produced during construction by ENGINEER or CONTRACTOR supplement the Drawings; these shall be included with Project record documents submitted by CONTRACTOR. Supplemental record drawings shall include drawings or sketches that are part of Change Orders, Work Change Directives, and Field Orders and that cannot be incorporated into the Drawings because of space limitations.
   b. Supplemental drawings submitted with record drawings shall be integrated with the Drawings and include necessary cross-references between drawings. Supplemental record drawings shall be on sheets the same size as the Drawings.
   c. When supplemental drawings developed by CONTRACTOR using computer-aided drafting/design (CADD) software are to be included in record drawings, submit electronic files for such drawings in accordance with Section 01 31 26, Electronic Document Protocol, as part of record drawing submittal. Label such files, “Supplemental Record Drawings”, including with CONTRACTOR’s name, Project name, and Contract designation.

C. Specifications and Addenda:
   1. Mark each Specifications Section to record:
      a. Manufacturer, trade name, catalog number, and Supplier of each material and equipment item actually provided.
      b. Changes made by Addendum, Change Orders, Work Change Directives, and Field Orders.

1.4 ELECTRONIC FILES FURNISHED BY ENGINEER

A. CADD files of the Drawings will be furnished by ENGINEER upon the following conditions:
   1. CONTRACTOR shall submit to ENGINEER a letter on CONTRACTOR letterhead requesting CADD files of the Drawings and indicating specific definition(s) or description(s) of how such files will be used, and specific

description of benefits to Owner (including credit proposal, if applicable) if the request is granted.

2. CONTRACTOR shall execute ENGINEER's standard agreement for release of electronic files and shall abide by the provisions of such agreement for release of electronic files. A copy is attached as Exhibit A.
3. Layering system incorporated in CADD files shall be maintained as transmitted by ENGINEER. CADD files transmitted by ENGINEER containing cross-referenced files shall not be bound by CONTRACTOR. Drawing cross-references and paths shall be maintained. If CONTRACTOR alters layers or cross-reference files, CONTRACTOR shall restore all layers and cross-references prior to submitting record documents to ENGINEER.
4. CONTRACTOR shall submit record drawings to ENGINEER in same CADD format that files were furnished to CONTRACTOR.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXHIBITS

A. ENGINEER's Electronic File Release Agreement is attached as Exhibit A following this Section's "End of Section" designation, and is part of this Specifications Section:

+ + END OF SECTION + +

AUS Electronic File Release Agreement

ELECTRONIC FILE RELEASE AGREEMENT

This Electronic File Release Agreement is made on this _____ day of _____, 20___ by and between Arcadis U.S. ("Arcadis") and _____ ("User") a corporation chartered under the laws of the State of _____, having its principal place of business at _____.

WHEREAS Arcadis and the Town of Ayer, Massachusetts ("Client") entered into an agreement entitled _____ dated _____(the "Contract") and pursuant to the terms of the Contract, Arcadis produced written work product which included ***reports, specifications, design plans, maps and drawings*** all related to the Sandy Pond Road Sanitary Sewer Rehabilitation project (the "Project").

WHEREAS Arcadis has also produced electronic versions of this written work product, including, but not limited to, CADD drawings / files (collectively referred to as "Electronic Files").

WHEREAS User has requested copies of the Electronic Files for its convenience and User represents it will use the electronic copy of these files solely for the purpose(s) of _____
_____.

NOW in consideration of the mutual promises herein and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Arcadis agrees to provide User with copies of the Electronic Files, and User agrees to the following terms and conditions:

1. User agrees that Arcadis shall retain ownership of the original Electronic Files and User shall have no ownership rights whatsoever in the Electronic Files.

2. Arcadis does not represent the Electronic Files to be suitable for use on any other project or for any other purpose. Any use, reuse or transposition of the Electronic Files and/or the information contained therein is at the User's sole risk.

3. User's use of the Electronic Files prepared by Arcadis shall not in any way relieve or negate User's responsibility for its obligations, duties and responsibilities to the Client, including but not limited to: coordination with other trades; checking of all applicable field conditions; taking and verification of field measurements, including dimensions, details, member sizes and gages; and measuring and verifying quantities of materials as required to facilitate complete and accurate fabrication and erection.

4. User agrees that all information added to User's drawing(s) derived, in any way, from the Electronic Files shall be clearly distinguished from the original files by distinctive presentation. Any such information that represents a proposed change from the original design shall be further distinguished from other information added by User.

5. User shall not transfer these Electronic Files to others without the prior written consent of Arcadis. If Arcadis consents to the transfer of the Electronic Files, User agrees to provide a copy of this Agreement to all third parties authorized to receive the Electronic Files.

6. To the fullest extent permitted by law, User shall indemnify and hold harmless Arcadis, the Client, their officers, directors, shareholders, employees, agents, insurance carriers and their successors and assigns from all claims, liabilities, causes of actions, judgments, fines, violations of any law, damages, losses and expenses including attorney fees arising, directly and indirectly, out of or resulting from the use of the Electronic files by User and the transfer of the Electronic Files from Arcadis to User. Arcadis shall not be liable for any damages, including without limitation, damages for lost profits, lost savings, business interruption, loss of business information, or other pecuniary loss or other incidental or consequential damages arising out of User's use or inability to use the Electronic Files.

7. User shall indemnify, defend and hold harmless Arcadis from all claims, losses and damages (including reasonable attorney's fees) arising from or related to any changes to, use or reuse of the Electronic Files and/or the information contained therein. User hereby waives and releases all claims against Arcadis resulting in any way from any changes to, use or reuse of the Electronic Files on the Project or any other project by anyone other than Arcadis.

8. User acknowledges and agrees that only the written versions of the Electronic Files are the final and official versions of Arcadis' professional work product on the Project and as such only the written version shall be relied upon solely and exclusively for the purposes of subsequent design and construction work. In the event a conflict arises between the signed and sealed hard-copy Contract Documents and the Electronic Files, the signed and sealed hard-copy Contract Documents shall govern The Electronic Files are provided only for the convenience of User and/or its representative.

9. Breach of this Agreement by User may give rise to Arcadis' need to pursue equitable relief to prevent a threatened or continual breach of this Agreement, which will cause or could cause Arcadis irreparable damage. Arcadis may pursue such equitable relief, whether it is for injunction, specific performance or other equitable remedy, without posting a bond and without having to prove actual injury as a condition for the relief requested.

IN WITNESS WHEREOF, the parties hereto have made and executed this Agreement as of the day and year shown above.

Arcadis U.S., Inc.	Town of Ayer, Massachusetts
By _____	By _____
Title _____	Title _____

SECTION 32 12 00

FLEXIBLE PAVING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install flexible, hot-mix, hot-laid, asphalt concrete pavement.
   2. The Work includes:
      a. Preparation such as sawcutting, milling where shown or indicated, cleaning, and other preparation for installing flexible pavements.
      b. Providing asphalt concrete paving materials.
      c. Providing tack coat material.
      d. Providing pavement markings where shown or indicated.
      e. Providing quality controls and testing.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before flexible paving Work.

C. Related Sections:
   1. Section 33 01 30.81, Manhole Rehabilitation.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AASHTO M320, Specification for Performance-Graded Asphalt Binder.
   2. AASHTO MP1a, Specification for Performance-Graded Asphalt Binder.
   3. AI MS-2, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.
   4. ASTM C1371, Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
   5. ASTM C1549, Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
   6. ASTM D242/D242M, Specification for Mineral Filler For Bituminous Paving Mixtures.
   7. ASTM D692/D692M, Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.
   8. ASTM D946/D946M, Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
   9. ASTM D977, Specification for Emulsified Asphalt.

10. ASTM D1073, Specification for Fine Aggregate for Bituminous Paving Mixtures.
11. ASTM D1188, Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples.
12. ASTM D2726, Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
13. ASTM D2950, Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
14. ASTM D3549, Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
15. ASTM D6690, Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
16. ASTM E329, Specification for Agencies Engaged in Construction Inspection and/or Testing.
17. ASTM E408, Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
18. ASTM E1918, Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
19. ASTM E1980, Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
20. FS TT-P-115, Paint, Traffic, Highway, White and Yellow.
21. USGBC LEED-NC, Reference Guide, For New Construction and Major Renovation.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Asphalt Concrete Production Facility:
      a. Production facility for asphalt concrete, tack coat materials, and other bitumastic materials shall be certified by the Massachusetts Department of Transportation Standard Specifications for Highways and Bridges and Town of Ayer DPW.

B. Regulatory Requirements:
   1. Reference Specifications and Details:
      a. Comply with applicable requirements of Massachusetts Department of Transportation Standard Specifications for Highways and Bridges (“Standard Specifications”) and Town of Ayer DPW.
   2. Obtain required highway and street rights-of-way work permits. (No fees)

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Submit the proposed asphalt concrete mix design for each asphalt concrete material, and other bituminous materials, required under this Section, providing complete data on materials, including location in the Work, source, material content and percentages, temperatures and all other pertinent data. Indicate proportion of bituminous material from reclaimed asphalt pavement.
      b. Proposed gradation for each aggregate to be used in flexible paving. Submit gradation test results for the same material furnished on a previous project. Indicate the proportion of reclaimed asphalt pavement.
   2. Product Data:
      a. Manufacturer's complete product data on all pavement marking materials proposed for use, including product literature, specifications, and recommended application techniques and other installation data.

B. Informational Submittals: Submit the following:
   1. Delivery Tickets:
      a. Submit copy of delivery ticket for each load of asphalt concrete, tack coat materials, and other materials obtained from asphalt concrete production facility, signed by CONTRACTOR
   2. Qualifications:
      a. Asphalt concrete production facility, when required by ENGINEER.
      b. CONTRACTOR's testing laboratory, when required by ENGINEER.

1.5 SITE CONDITIONS

A. Weather Limitations:
   1. Temperature:
      a. For base course and binder course paving lifts equal to or greater than two inches thickness, atmospheric temperature shall be 40 degrees F and rising.
      b. For surface course paving or other pavement courses in lifts less than two inches thick, temperature of surface on which pavement is to be placed shall be 50 degrees F or greater.
   2. Prohibitions:
      a. Do not place flexible paving materials when weather is foggy or during precipitation.
      b. Do not place flexible paving materials when the base on which the material will be placed contains moisture in excess of optimum.
      c. Place flexible paving materials only when ENGINEER concurs that weather conditions are suitable.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Class I Bituminous Concrete Pavement, Type I-1:
   1. General: All materials for bituminous concrete pavement shall be as listed below and shall conform to the requirements of Division III of Massachusetts DOT "Standard Specifications" (1988), thereof, as applicable. Pavement courses shall match existing courses after compaction.
   2. Sub-base Course: Sub-base course shall be Type B gravel and shall be installed in conformance with "Standard Specifications", Section 401, Gravel Sub-Base. Sub-base course shall be installed to a minimum compacted thickness of 6 inches.
   3. Base Course: Base course shall conform to the requirements for Class I Bituminous Concrete Base Course, Type I-1, as specified in Division III of the "Standard Specifications". Base course thickness shall be a minimum of 2-inches. The base course shall be treated with Bitumen Prime Coat, at a rate of 0.4 gal per sq yd.
   4. Surface Course: Surface course shall be installed to match the depth of the existing pavement and shall consist of a minimum of 2-inch layer of Bituminous Concrete Mixture (Top Course) conforming to "Standard Specifications", Division III, Class I Bituminous Concrete Pavement Type I-1.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine the subbase and base on which flexible paving will be installed. Notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

B. Do not place materials on subgrades, or subbase that is muddy or has water thereon.

3.2 CUTTING PAVEMENT

A. Cuts for removal of concrete or asphalt pavement shall be made with clean, straight, sharp edges and parallel sides with pneumatic cutters or other reviewed power tools. Where a concrete pavement is to be removed, it shall be saw cut and completely removed between construction joints. Pavement materials shall be removed and disposed of, in accordance with all federal, state and local regulations and as approved in writing by the ENGINEER.

3.3 DISPOSAL OF EXCAVATED MATERIAL

A. Excavated materials which are not suitable or required for backfill shall be removed and disposed of by the CONTRACTOR, in accordance with all federal, state and local regulations and as approved in writing by the ENGINEER.

3.4 GENERAL

A. As required and shown, a smooth transition section shall be provided between new permanent pavement and existing pavement. If required, existing pavement shall be removed or scarified to the required elevations to permit the surface course to be placed.

B. Materials for pavement shall be mixed, delivered, placed and compacted in accordance with the referenced specification, Sections M3.11 and 460 and as specified herein.

C. Whenever the subbase becomes dry enough to cause dust problems, spread calcium chloride uniformly over the gravel surface in sufficient quantity to eliminate dust.

D. When the air temperature falls below 50 degrees F, extra precautions shall be taken in drying the aggregates, controlling the temperatures of the materials and placing and compacting the mixtures.

E. No mixture shall be placed when the air temperature is below 40 degrees F, nor when the material on which the mixtures are to be placed contains frost or has a surface temperature not suitable to the ENGINEER.

F. No vehicular traffic or loads shall be permitted on the newly completed pavement until adequate stability has been attained and the material has cooled sufficiently to prevent distortion or loss of fines. If the climatic or other conditions warrant it, the period of time before opening to traffic may be extended at the discretion of the ENGINEER.

G. No work shall be done during rainy weather or when weather conditions as to temperature or otherwise are, in the ENGINEER's judgment, unfavorable for obtaining satisfactory results.

H. Commencing work in any area shall constitute acceptance of that surface. All defects resulting from use of unaccepted surfaces shall be corrected at no additional cost to the OWNER.

3.5 PLACEMENT OF PERMANENT PAVEMENT

A. Existing pavement shall be cut back in a neat, true line located 12 inches beyond any damaged area. The new bituminous pavement shall blend and match with the level of existing pavement surface. The joints shall be treated with SS-1 type

asphaltic emulsion paint binder or, as specified by the ENGINEER, to assure a satisfactory bond between the existing and newly laid bituminous material.

B. Remove and dispose of existing pavement to provide for a 4-inch (8-inches within State Routes) bituminous concrete pavement.

C. Edges of the pavement shall be straight and sound. Broom and tack coat all edges with emulsified or cutback asphalt.

D. Place binder course and compact to 2-inch thickness by steel-wheeled roller.

E. Broom and tack coat edges of existing pavement and binder course with emulsified or cutback asphalt.

F. Place top course and compact to 2-inch thickness, flush with surface of existing pavement.

G. Raise all manhole and catch basin frames, gate valve and curb stop boxes, gas drips and valves, and any other pavement penetrations to finished elevation of the new trench width pavement. All raised appurtenances shall be grouted with concrete or otherwise as approved by the ENGINEER to firmly support them flush with the surface of the new pavement.

3.6 PAVEMENT MARKINGS

A. The CONTRACTOR shall reline all streets with pavement marking paint of the fast drying type (p-226) conforming to Section M7.01.03 and M7.01.04 of the Commonwealth of Massachusetts Department of Public Works Standard Specifications for Highways and Bridges.

B. Pavement markings shall be painted within 10 days of installation of final pavement as directed by the ENGINEER.

C. Reline all streets with pavement marking paint of the type which existed previously.

3.7 PAVEMENT GUARANTEE

A. Furnish the OWNER with a written guarantee warranting all permanent pavement work for a period of two years from and after completion and acceptance of same. The execution of this Contract shall bind the CONTRACTOR to immediately repair or replace at his own expense, when directed by the OWNER, any and all portions of the permanent pavement work installed under this Contract that may become defective within said period.

+ + END OF SECTION + +

SECTION 33 01 30.16

TELEVISION INSPECTION OF SEWERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all labor, materials, tools, equipment and incidentals as shown, specified, and required to perform television (TV) inspection of existing, new and rehabilitated piping including sewer mains and sewer lateral connections.

1.2 DEFINITIONS

A. Pre-Construction Inspection: TV inspection of sewers and/or laterals to determine the location of construction, structural and O&M features and to ascertain that the condition of the pipe meets acceptable standards for the proposed rehabilitation.

B. Lateral Connection Testing Observations: TV recording of testing and retesting of lateral connections.

C. Post-Construction Inspection: TV inspection of repaired or rehabilitated sewer mains and lateral connections to determine the location of construction, structural and O&M features and to verify that all repairs have been performed.

D. Warranty Inspection: TV inspection of sewer to be performed following a specified waiting period after completion of rehabilitation.

1.3 REQUIREMENTS:

A. The CONTRACTOR shall be aware that this Contract requires work in active sewers and shall follow all federal, state and local requirements for safety in confined spaces.

1.4 RELATED SECTIONS

A. Section 01 41 28, Confined Space Entry Permit

B. Section 01 51 41, Temporary Pumping

C. Section 33 01 30.41, Cleaning of Sewers

D. Section 33 01 30.65, Pressure Testing of Sewer Pipe Joints and Tap Connections

E. Section 33 01 30.61, Packer Injection Grouting

F. Section 33 01 30.72, Cured-in-Place Pipe Lining – Steam Cured

G. Section 33 01 30.73, Cured-in-Place Pipe Lining – UV Cured

H. Section 33 01 30.74, Cured-in-Place Lateral Lining

1.5 PERFORMANCE REQUIREMENTS

A. Inspection shall be performed by a National Association of Sewer Service Companies (NASSCO) *Pipeline Assessment Certification Program* (PACP) certified operator and shall meet the coding and reporting standards and guidelines as set by PACP. All report annotations, pipe conditions and pipe defects shall be identified properly using PACP codes as defined by PACP, and severity ratings shall be calculated according to PACP.

B. Quality of inspection recording shall be acceptable to ENGINEER when viewed on a standard computer monitor.

1.6 SUBMITTALS

A. CCTV equipment, including make, model, age of video systems and tractors, and documentation that CCTV software is PACP v4.4 -certified. PACP-compliant software will not be accepted.

B. Copies of PACP certificate for inspectors completing the work.

C. Submit two (2) copies of external hard drives containing the videos of the television inspections and TV Inspection Reports to the ENGINEER for review on a weekly basis, by each Wednesday, for CCTV completed during the preceding week.

1. Provide external hard drives of a quality sufficient for the ENGINEER to evaluate the condition of the sewer, locate the sewer service connections, and verify cleaning. If quality is not sufficient, CONTRACTOR shall re-televise the sewer segment and provide a new external hard drive and report at no additional cost to the OWNER. Camera distortions, inadequate lighting, dirty lens, or blurred/hazy picture will be cause for rejection of an external hard drive and rejection of the associated line segment.
2. External hard drives submitted become the property of the OWNER.
3. CONTRACTOR shall maintain a master copy of all TV external hard drives and TV Inspection Reports submitted, until final acceptance of contract, at which time all copies are to be turned over to the OWNER.
4. The pre-and post-rehabilitation television inspection video external hard drives shall not be edited.

1.7 REFERENCE STANDARDS

A. NASSCO prepared *Pipeline Assessment and Certification Program*, Version 6.0.1 Reference Manual, November 2010. This manual includes a standard TV inspection form and sewer condition codes.

PART 2 - PRODUCTS

2.1 TELEVISION EQUIPMENT

A. Closed Circuit TV Equipment: Select and use closed-circuit television equipment that will produce a color recording. The camera and video system components shall have the following properties:

1. Equipped with footage counter accurate to two tenths of a foot that displays on the TV monitor the exact distance of the camera from the starting point of the recording.
2. Lighting system that allows the features and condition of the pipe to be clearly seen. Lighting shall not cause shadows or loss of color within the field of view of the camera.
3. Capable of operating in 100 percent humidity conditions.
4. Capable of producing a minimum 470 lines of vertical resolution color video picture. Picture quality and definition shall be to the satisfaction of the ENGINEER.

B. Pipe Inspection Camera: The pipe inspection camera and video components shall have the following additional properties:

1. Capable of producing a video recording using a pan-and-tilt, radial viewing, pipe inspection camera that pans ± 275 degrees and rotates 360 degrees.
2. Camera height adjustment so that the camera lens is always centered at one-half the inside diameter, or higher, in the pipe being televised.
3. Include a reflector in front of the camera if necessary to provide acceptable video image quality in large diameter pipe.

C. TV Studio: TV studio is to be contained in an enclosed truck, trailer or van. It shall have room and seating for the operator and the ENGINEER and also room for at least one standing visitor with the doors closed. The studio shall have air conditioning and heating. Normal operation of all equipment, including the TV camera, monitor, and winches is to be from a control panel in the studio. When joint testing and sealing is to be performed, the equipment shall be contained in the same unit as its TV equipment and shall be operated from the same control panel.

D. Recording: All recordings are to be in digital format.

1. Image Capture – Digitized picture images shall be stored and be exportable as JPEG formats.

2. Video Capture - Full time live video and audio files shall be captured for each pipe segment and lateral inspected. The files shall be stored in industry standard Windows Media or MPEG-4 format on a USB 2.0 external hard drive and viewable on a personal computer that utilizes MicroSoft Media Player, version 9.0. Alternate digital formats will not be accepted unless approved by the ENGINEER in advance of submittal. The video shall have a minimum resolution of 640 pixels (x) by 480 pixels (y) and an encoded frame rate of 29.97 frames per second. System shall perform an automatic disk image/file naming structure to allow saved video/data sections to be "Burned" to digital format. It shall have the capability of "burning" a minimum of 120 minutes of recording to the external hard drive. The video recording shall be free of electrical interference and shall produce a clear and stable image. The audio recording shall be sufficiently free of background and electrical noise as to produce an oral report that is clear and discernable. The digital recordings and inspection data shall be cross-referenced to allow instant access to any point of interest within the digital recording.

PART 3 - EXECUTION

3.1 TELEVISUAL INSPECTION

A. Prior to TV inspection, clean sewer lines, laterals and manholes in accordance with Section 33 01 30.41, Cleaning of Sewers. Re-clean any sewer line or manhole found to be insufficiently cleaned during the TV inspection process.

B. Perform Post-construction Inspections of cured-in-place materials after the waiting period specified in applicable specification for the cured-in-place materials.

C. Televise the sewer line to document the condition of the line. Notify the ENGINEER 48 hours in advance of any TV inspection so that the ENGINEER may observe inspection operations. Provide a color recording showing the completed work.

D. Center camera in manhole invert to the extent allowed by the channel geometry. For inspections from manholes, pan and record the entire circumference of the pipe penetration/manhole wall.

E. With camera rolling, perform the distance counter preset. If a preset point on the CCTV cable is used to set the counter, CONTRACTOR shall back up the camera after setting the preset and record the entry to the pipe.

F. Mainline inspection shall be from center of the starting manhole to the center of the ending manhole. Measure distances along the pipe from the inside of manhole wall of the starting manhole to inside of manhole wall of the downstream manhole.

G. Prior to recording the location of defects, construction features and service connections, remove slack in the cable of the television inspection camera to ensure metering device is designating proper footage. Check accuracy of the measurement meters daily by use of a walking meter, roll-a-tape, or other suitable device.

H. Center the camera in the middle of the pipe.

I. Move the camera through the line (in the downstream direction whenever possible) at a uniform rate not to exceed 20 feet per minute.

J. When infiltration or other defects are evident, use pan and tilt to document pipe condition. Stop elsewhere when necessary to ensure proper documentation of the sewer's condition.

K. Stop at every lateral connection. Center the camera so that the lighting and the pan and tilt view can be used to inspect as far into the lateral connection as possible. Pan the circumference of the tap, recording all defects found in the service connection. Where lateral flow is observed, observe flows from service connections for approximately two minutes to ascertain if the flow is sanitary or extraneous flow. The video recording may be paused during observation. Record results of the flow observed on video recording and inspection logs.

L. Capture color still shots of video recordings for all defects encountered.

M. Use manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions to move the camera through the sewer line.

N. TV inspection recordings shall be continuous for each pipe segment.

O. Adjust light levels, clean fouled or fogged lens, and allow vapor to dissipate from camera lights in order to produce acceptable recordings. All TV inspection recordings that do not meet the specified requirements shall be re-televised at no additional cost to the OWNER.

P. Provide audio comments on the external hard drives regarding any and all observations, including location and condition of services, structural defects, estimated flow rate of infiltration, root intrusion, grease or debris build up, and other obstructions, blockages, or pertinent observations.

3.2 FLOW CONTROL

A. Adequately control the flow in the section being televised. Plugging or bypassing, in accordance with Section 01 51 41, Temporary Pumping, of the flows may be used to accomplish this. Recordings made where the depths of wastewater flow shown below are exceeded will be rejected:

Pipe Diameter (Inches)	Depth of Flow (% of Pipe Diameter)
6-10	10
12-24	15
Over 24	20

B. Whenever flows in a sewer line are blocked, plugged, pumped, or bypassed, take sufficient precautions to protect the sewer lines from damage that might be inflicted by excess sewer surcharging. Further, take precautions to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved. No overflows are permitted. The CONTRACTOR is responsible for all damages.

C. CONTRACTOR is responsible for all damages to CONTRACTOR owned and operated equipment, OWNER facilities, and privately-owned facilities caused by malfunction of plugs, pumps or other CONTRACTOR equipment. In the event of a failure or malfunction of CONTRACTOR equipment, CONTRACTOR is responsible for all work necessary to restore facilities to pre-construction condition including but not limited to excavation and restoration of sewer lines and roadways required to retrieve malfunctioning or stuck cameras, plugs and hoses.

It is anticipated that portions of the sanitary sewer are bowed or bellied and as a result the camera will be submerged. Wherever the camera encounters a submerged condition, or where the wastewater flow depth exceeds the maximum allowable, reduce the flow depth to an acceptable level by performing the survey TV inspection during minimum flow hours, or by pulling a camera with swab, high-velocity jet nozzle or other acceptable dewatering device. Recordings made while floating the camera are not acceptable unless approved by ENGINEER.

3.3 PASSAGE OF TV CAMERA

A. Do not pull or propel the television camera through the line at a speed greater than 20 feet per minute.

B. If during TV inspection of a pipe segment the camera is unable to pass an obstruction even though flow is unobstructed, televise the pipe segment from the opposite direction in order to obtain a complete recording of the line. Measure the distance between the manholes (centerline to centerline) with a tape or wheel to accurately determine the total length of the manhole segment. If such a condition arises, notify the ENGINEER and OWNER to determine if an obstruction removal or point repair is necessary. If a point repair is authorized, repair the pipe at the designated location and then re-televise the manhole section to verify completion of the point repair, unless waived by the ENGINEER.

1. When the camera is being pulled from the other direction in order to survey on either side of an obstruction and a second repair location is encountered away from the first obstruction, notify the ENGINEER and request a review of the external hard drive.

2. If two point repairs are completed, re-televise the pipe section. Generally, up to 20 feet of the sewer pipe from the finished end of the first point repair to the starting end of the second point repair may be lamped or physically inspected to verify the condition of the sewer without further TV inspection.
3. The ENGINEER makes no guarantee that the sewer specified or proposed for rehabilitation TV inspection after cleaning, is clear for the passage of the camera set-up. Select the appropriate equipment, tools, and methods for securing safe passage of the camera.

C. During preliminary TV inspection, pipeline defects and infiltration/inflow sources shall be panned by the inspection camera. The CONTRACTOR shall provide estimates of the flow rate of infiltration/inflow. All defects and infiltration/inflow sources shall be pan and tilt inspected to determine the condition. Any infiltration/inflow sources will be observed for a minimum of two minutes to estimate the flow entering the sewer line. Results will be recorded in the written logs.

D. During pre-rehabilitation TV inspection, camera passage should show the line is ready to rehabilitate. Report any variations between previous reported (existing data) conditions and the actual conditions encountered to the ENGINEER.

E. For post-rehabilitation TV inspection, exercise the full capabilities of the camera equipment to document the completion of the rehabilitation work and the conformance of the work to the Specifications. Provide a full 360 degree view of pipe, joints and service connections.

3.4 INSPECTION DELIVERABLES

A. Written Inspection Reports (2 copies)
   1. Provide printed location records to clearly identify the location of each defect, or lateral connection, in relation to adjacent manholes, using a standard stationing system zeroed on the upstream manhole. Record all information requested using proper NASSCO PACP defect codes. The reports shall include at least the minimum amount of information required by PACP, including required PACP header information. Color still shot images of all defects encountered shall be included with each pipe segment.

B. Electronic Inspection Reports
   1. Provide a NASSCO PACP v4.2 certified database listing all PACP required data fields for each pipe segment on CD (2 copies).

C. Inspection Recordings (2 copies of all external hard drives)
   1. Provide digital inspection recordings for all recordings, unless otherwise specified in Paragraph 3.4.D.
   2. Recording shall be of a quality sufficient for ENGINEER to evaluate the condition of the sewer, locate the sewer service connections, and verify cleaning and joint testing. If ENGINEER determines that the quality is not sufficient, re-televise the sewer segment and provide a new recording and report at no additional compensation. Camera distortions, inadequate lighting, dirty lens, or blurred/hazy picture will be cause for rejection. Payment for televised inspection will not be made until ENGINEER approves the recordings and reports.
   3. Digital recordings: Each pipe segment must be its own electronic file. Electronic recording file must allow snap scrolling to allow easy and quick access of the entire recording.

4. Each external hard drive must have a file index whose name contains the pipe segment reference number.
5. Maintain a master copy of all recordings and Inspection Reports for two years after delivery of reports and recordings.
6. Label each external hard drive with the following information:

   File Number.

   CONTRACTOR's Name.

   Project Name, Location, Title.

   Contract Number.

   Drawing Number.

   Inspection Type: Pre-Rehabilitation, Post-Rehabilitation, Warranty Re-Inspection.

   Date Televised.

   Pipe Segment Asset Identification Number.

   Wastewater file number.

   External Hard Drive #.

   Date submitted.

D. Inspection deliverables for different types of inspections are defined below.

1. Physical Condition Inspection: One copy on a 400mbs USB 2.0 external hard drive of PACP formatted database including, but not limited to, digital inspection recordings, defect call-out tables, defect snapshots, field notes and asset condition reports.
2. Pre-Construction Inspection: One copy on a 400mbs USB 2.0 external hard drive of PACP formatted database including, but not limited to, digital inspection recordings, defect call-out tables, defect snapshots, field notes and asset condition reports.
3. Post-construction Inspection:

   Two copies of Written Inspection Reports in bound report with project name on binder spine. Reports to be filed in ascending order by upper manhole number.

   One copy on a 400mbs USB 2.0 external hard drive of the PACP formatted database including, but not limited to, digital inspection recordings, defect call-out tables, defect snapshots, notes fields and asset condition reports.
4. Warranty Inspection: Same as Post-construction Inspection.

++ END OF SECTION ++

SECTION 33 01 30.41

CLEANING OF SEWERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all labor, materials, tools, equipment and incidentals as shown, specified, and required to clean the pipelines, laterals and manholes.

B. The cleaning Work required includes, but is not limited to, the following:

1. Field locating all manholes along the sewer reaches to be cleaned.
2. Cleaning existing sanitary sewers and laterals in preparation for rehabilitation.
3. Cutting of roots, grease, intruding sealing ring material and objects wedged in pipe joints from existing sanitary sewers and laterals.
4. Removal of debris from the sewers and laterals.
5. Pressure washing of manhole walls, rungs, channel and bench.
6. Disposal of waste and sediment.
7. Cleaning up as the Work progresses and after the completion of all Work activities.
8. All other Work required for the sufficient cleaning of the pipelines to complete rehabilitation per the design.

1.2 DEFINITIONS (NOT USED)

1.3 RELATED SECTIONS

A. Section 01 41 28, Confined Space Entry Permit

B. Section 01 51 41, Temporary Pumping

C. Section 33 01 30.16, Television Inspection of Sewers

D. Section 33 01 30.65, Pressure Testing of Sewer Pipe Joints and Tap Connections

E. Section 33 01 30.61, Packer Injection Grouting

F. Section 33 01 30.72, Cured-in-Place Pipe Lining – Steam Cured

G. Section 33 01 30.73, Cured-in-Place Pipe Lining – UV Cured

H. Section 33 01 30.74, Cured-in-Place Lateral Lining

I. Section 33 01 30.81, Manhole Rehabilitation

1.4 GENERAL PRECAUTIONS

A. This Contract requires work in active sewers. Adhere to all federal, state and local requirements for safety in confined spaces.

B. Take precautions to protect sewer mains, laterals and manholes from damage that might be inflicted by the improper selection of the cleaning process or improper use of the equipment.

C. When using hydraulically propelled devices, take precautions to ensure that the water pressure created does not cause damage or flooding to public or private property.

D. Do not surcharge the sewer beyond the elevation that could cause overflow of sewage into area waterways, homes, or buildings or onto the ground.

E. Some of the manholes accessing sections of the sewer included in this work are on private property where either specific easements and/or trespass agreements with individual property owners have or have not been negotiated. All easements are typically shown on the Drawings, and copies of the pertinent trespass agreements are available for review by contacting the ENGINEER. Do not enter private property for which access agreements with the OWNER have not been executed. Limit operations to those specifically approved in said trespass agreements.

F. Restore or repair any facility, public or private, which is damaged by CONTRACTOR actions at no cost to OWNER.

G. The CONTRACTOR shall be aware that this Contract requires work in active sewer manholes and shall follow all federal, state, and local requirements for safety when in confined space. The CONTRACTOR shall be required to conform with all guidelines by the Occupational Safety and Health Administration Federal Regulations, 29 CFR Ch. XVII, Section 01 41 28, Confined Space Entry Permit.

1.5 SUBMITTALS

A. Specifications of the sewer cleaning equipment, including performance data on pump, hose diameter and length, tank capacity, and intended nozzles and root cutters, to be used on the job. Provide a chart that shows hose length and diameter versus volume and pressure.

B. Specifications on the equipment to be used to remove sediment and debris at the downstream manhole of each reach to be cleaned.

C. Plan for disposal of debris and sediment removed from the sewer lines.

D. Quantity of sediment removed (dry weight)

E. Copy of manifest from disposal facility.

1.6 QUALIFICATIONS

A. CONTRACTOR shall have experience in the cleaning of 50,000 LF of sewers. Documentation of experience shall be furnished to the ENGINEER upon request.

PART 2 - PRODUCTS

2.1 MAINLINE SEWER AND LATERAL CLEANING EQUIPMENT

A. Sewer cleaning equipment shall consist of truck-mounted, high velocity hydro-cleaning equipment. The equipment shall be provided with a minimum of 500 feet of one-inch inner diameter high-pressure hose with a selection of high velocity nozzles, as required for the cleaning operation. The various nozzles shall produce a scouring action from 10 to 45 degrees in all size sewers to be cleaned. Use nozzles matched to the pumps and the site-specific cleaning requirements. Mount all nozzles with skids. A tiger tail or boot or downhole roller is required. A pressure gauge shall show operating pressure and a flow meter shall show flow rate. A table to translate shown pressures to delivery pressure shall accompany each cleaner unit.

B. The pumps shall be capable of delivering a minimum 60 gpm at 2,000 psi at the nozzle head. A relief valve shall regulate pressure to the nozzle. The unit shall carry its own water tank, minimum of 1,000 gallons, auxiliary engines and pumps, and a hydraulically-driven hose reel.

C. All controls shall be located so that the equipment can be operated above ground.

D. Include appropriate adaptors, hoses and nozzles for cleaning laterals from mainline sewer. If utilizing an existing cleanout to clean lateral, provide equipment suitable for launching through cleanout to clean lateral.

E. The CONTRACTOR shall certify that backup cleaning equipment, including machines, devices, tools, etc is available and can be delivered to the site within 24 hours.

2.2 MANHOLE CLEANING EQUIPMENT

A. Provide a high velocity washing hose for cleaning of the walls, rungs, channel and bench of the manhole. The hose shall have an adjustable nozzle capable of producing flow from a fine spray to a solid stream. All controls shall be located so that the equipment can be operated above ground.

2.3 VACUUM EQUIPMENT

A. Provide equipment capable of removing all sand, dirt, rocks, roots, and other debris from the sewer and manhole.

B. Provide screens to prevent scoured debris from migrating downstream of the limits of the Work.

2.4 CUTTING EQUIPMENT

A. Mainline Sewers: Provide equipment capable of mechanically removing roots, grease, tuberculation, mineral deposits, and intruding seal material. Devices shall include a root saw, spring blade root cutter chuck, chaincutter, or approved equal.

B. Laterals: For laterals with cleanouts, provide equipment that can mechanically cut roots and grease from lateral. For laterals without cleanouts, provide appropriate equipment that can be launched from the main to remove roots.

2.5 FLUSHING/CLEANING WATER

A. Coordination for access to hydrants shall be made with the Town on a daily basis. Only hydrants approved by the Town will be allowed. The Contractor shall provide a tested and certified backflow preventer and meter for all water obtained from hydrants and be responsible for reporting water usage at the end of the project and at any point during the project as requested by the Town or Engineer.

B. If cleaning water is obtained from another source, the Contractor shall provide proof that all flushing water was acquired lawfully.

PART 3 - EXECUTION

3.1 MAINLINE SEWER CLEANING

A. Thoroughly clean all pipeline reaches in order to permit an unrestricted inspection by closed circuit television and pipeline rehabilitation by cured in place liner. Particular emphasis shall be afforded to the removal of accumulated grease, roots, tuberculation, mineral deposits, sand, rocks, sludge and other debris so that the video inspection will show clearly all portions of the pipe being inspected. Pressure at the nozzle shall be between 1500 psi and 2000 psi and flow rate shall be between 60 gpm and 75 gpm during cleaning operations in the sewer, unless otherwise approved by the ENGINEER.

B. Provide temporary bypass pumping as necessary for complete pipeline cleaning and CCTV inspection.

C. Clean upstream reaches of sewers before the downstream reaches.

D. Insert cleaning equipment into the downstream manhole of a given reach and pull the debris downstream. Reverse setups may be used if all debris is removed (i.e., no material is passed to the adjacent pipe segment).

E. In mainlines, at a minimum, make one pass with a 30º - 45º nozzle at a rate not greater than 20 feet per minute, and one pass with a 10º - 15º nozzle at a rate not greater than 30 feet per minute.

F. Rig winching equipment so as not to damage the existing pipeline or manholes.

G. During cleaning, restrict the flow level in the pipe to a maximum of 30 percent of the pipe diameter. Take particular care to avoid flooding house connections during cleaning operations.

H. Remove any blockages of lateral building connections resulting from the cleaning or other items of Work by cleaning of the building connection at no additional cost to the OWNER.

3.2 MANHOLE CLEANING

A. Wash the wall, bench, channel and rungs of the manhole to remove accumulated debris, grease, sediment, and grit.

3.3 ROOT, GREASE, TUBERCULATION, MINERAL DEPOSITS,AND INTRUDING SEAL MATERIAL REMOVAL

A. Remove all roots that could prevent the sealing of a packer, the proper application of chemical sealants or installation of a cured-in-place liner. Remove roots by suitable mechanical cutting devices or by hydraulic procedures such as with high-pressure jet cleaners. No roots of length greater than one and a half inches (1½-inch) shall remain following root removal procedures.

B. Remove all grease and mineral deposits which could prevent the sealing of a packer, the proper application of chemical sealants, or the installation of a cured-in-place liner. Use suitable mechanical cutting devices to remove grease.

C. Remove all tuberculation that could prevent proper installation of a cured in place liner by chain-cutter or other approved method.

D. Remove objects wedged in pipe joints and intruding sealing ring material that interferes with the rehabilitation of sewer lines.

3.4 LATERAL CLEANING AND ROOT CUTTING

A. Thoroughly clean the portion of the lateral to be inspected or rehabilitated with cured-in-place lining in order to permit an unrestricted inspection by closed circuit television. Particular emphasis shall be afforded to the removal of accumulated grease, roots, sand, rocks, sludge and other debris so that the video inspection will show clearly all portions of the pipe being inspected. Minor hair roots that will not interfere with lateral lining are not required to be removed from laterals.

3.5 DEBRIS REMOVAL

A. Remove all bricks, rocks, debris, sludge, dirt, sand, grease, roots, tuberculation, mineral deposits, and other materials from the sewer and manhole and collect and remove the resulting debris from the downstream manholes of the sewer sections being cleaned. Utilize control measures in downstream manholes as necessary to prevent debris, sludge and other materials from passing through manholes to a downstream sewer section not scheduled for cleaning by CONTRACTOR that same day.

B. When removing materials from manholes, return the discharge and drainage liquid stream to the downstream sewer and discharge downstream for disposal. Under no circumstances shall sewage or solids be dumped onto the ground surface, street, stream, ditches, catch basins, or storm drains. All solids and semi-solids shall be placed in a watertight container so that no spillage or leakage will occur, covered to minimize odors, and disposed by the CONTRACTOR. The CONTRACTOR is responsible for all operations and costs associated with removal, transportation, and disposal of debris collected during the cleaning operations.

3.6 DISPOSAL

A. The Contractor shall be responsible for offsite disposal of debris and other material removed as part of the cleaning process.

B. Maintain and have available upon request a copy of the manifest from the disposal facility.

3.7 FIELD QUALITY CONTROL

A. Acceptance of pipeline cleaning shall be made upon the successful completion of the television inspection documenting that all required debris, solids, sand, roots, tuberculation, mineral deposits, grit and grease are removed to the satisfaction of the ENGINEER. If television inspection shows debris, solids, sand, roots, tuberculation, mineral deposits, grease, or grit remaining in the line, re-clean and re-inspect the pipeline at no additional compensation to the OWNER.

++END OF SECTION++

SECTION 33 01 30.43

REMOVAL OF PROTRUDING SERVICE CONNECTIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The CONTRACTOR shall furnish all equipment, labor, and materials necessary to internally remove protruding service connection taps, protruding pipe material at joints, foreign material at joints, and excess mortar between joints in those sewers scheduled to be rehabilitated. Ensure that the sewer is clean of all dirt and debris following removal of protruding service connections.

B. Remove only those taps that protrude sufficiently as specified herein which are determined to interfere with the pipe rehabilitation. The intent is to remove the minimum number of protruding taps necessary to allow the entire sewer reach to be rehabilitated.

C. Where necessary and feasible, the CONTRACTOR shall perform a reverse set-up of the testing and sealing equipment rather than remove a protruding tap.

D. Where possible, removal of protruding taps shall be completed before sewer line cleaning is conducted. Where this is not possible, the CONTRACTOR shall ensure that the sewer is clean of all dirt and debris before sewer rehabilitation is begun.

E. The CONTRACTOR shall maintain wastewater flows, including bypass pumping, as required at all times during the performance of this work.

F. The CONTRACTOR shall remove all dirt and debris caused by tap removal. Excess material will not be allowed to enter the wastewater system and carried to downstream reaches.

1.2 RELATED SECTIONS

A. Section 01 51 41, Temporary Pumping

B. Section 33 01 30.16, Television Inspection of Sewers

C. Section 33 01 30.41, Cleaning of Sewers

D. Section 33 01 30.72, Cured-in-Place Pipe Lining – Steam Cured

E. Section 33 01 30.73, Cured-in-Place Pipe Lining – UV Cured

1.3 GENERAL PRECAUTIONS

A. Take precautions to protect sewer mains and manholes from damage that might be inflicted by the improper selection of the cleaning process or improper use of the equipment.

B. When using hydraulically propelled devices, take precautions to ensure that the water pressure created does not cause damage or flooding to public or private property.

C. Do not allow the sewer to fill with sewage above the crown of any pipe, or beyond any elevation below the crown that could cause overflow of sewage into area waterways, homes, or buildings or onto the ground.

PART 2 – PRODUCTS

2.1 EQUIPMENT

A. Protruding taps shall be removed using an internal, remote-controlled intruding pipe remover. Excavation and replacement of protruding taps will not be allowed except under special situations authorized in writing by the ENGINEER.

B. The equipment shall consist of a main body containing a rotating head assembly equipped with carbide cutting edges. The rotating cutting head shall be driven by air or by electricity and shall be capable of cutting concrete, vitrified clay pipe, mortar, or other materials commonly used for pipe construction with the exception of cast iron or steel.

C. The equipment shall be pulled through the sewer using winches and a cable set up between adjacent manholes.

D. If necessary, the equipment shall be positioned using a CCTV camera in conjunction with the cutter assembly.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Remove the protruding service connection to the point where it is flush with the inside wall of the sewer main.

B. The CONTRACTOR shall maintain a complete record of all taps that were removed and furnish two (2) copies of this record at the completion of this work.

1. The list shall show the Work Assignment Number, date, street, and sewer reach (by manhole numbers), station and location (left, right and top) of each tap removed.

2. The list shall also show similar data for any taps that were not successfully removed, as well as the reason why removal was unsuccessful.

C. The CONTRACTOR shall protect existing sewer lines and service connections from damage caused by improper use of the equipment.

1. Damage to a sewer or service connection caused by removal of a tap shall be repaired immediately, as directed by the ENGINEER, at the CONTRACTOR's expense.

D. The CONTRACTOR shall remove all dirt and debris from the sewer following completion of tap removal in that reach.

++ END OF SECTION ++

SECTION 33 01 30.61

PACKER INJECTION GROUTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to grout pipeline joints, joints in laterals connected to manholes, lateral tap connections using a packer injection method.

B. Packer injection grouting is used to reduce the infiltration within the pipeline, seal annular space between liners and host pipes at lateral tap connections, seal pipe joints that have failed the joint test criteria described in Section 33 01 30.65, Pressure Testing of Sewer Pipe Joints and Tap Connections, and prevent further loss of pipe bedding into the pipe.

C. Packer injection grouting shall be accomplished by pressure injection of chemical grout into the soils encompassing the pipe joint. Chemical grouts shall be designed to be injected into the soil surrounding the pipe, which stabilizes the soil and forms a permanent impermeable seal called a soil ring, and into the annular space between liners and host pipes. Adequate volumes of grout must be injected to form an effective seal. This application will be through structurally sound joints and penetrations from within the pipe (packer method) in tandem with a closed circuit television inspection system.

1.2 REQUIREMENTS

A. This Contract requires work in active sewers. Adhere to all federal, state and local requirements for safety in confined spaces.

B. Worker safety training should include reviewing the hazards associated with hoses, pumps, tanks, couplers, compressors, bottles, motors, and all other related application apparatus. Additional safety considerations including safely handling, mixing, and transporting of chemical grouts should be provided by the grout manufacturer or supplier or both. Their safe operating practices and procedures should describe appropriate personal protective equipment (PPE) for the various grouting operations. Operations covered should include the proper storage, transportation, mixing, and disposal of grouts, additives, and their associated containers.

1.3 RELATED SECTIONS

A. Section 01 41 28, Confined Space Entry Permit

B. Section 01 51 41, Temporary Pumping

C. Section 33 01 30.16, Television Inspection of Sewers

D. Section 33 01 30.41, Cleaning of Sewers

E. Section 33 01 30.43, Removal of Protruding Service Connections

F. Section 33 01 30.65, Pressure Testing of Sewer Pipe Joints and Tap Connections

G. Section 33 01 30.74, Cured-in-Place Lateral Lining

1.4 QUALIFICATIONS

A. CONTRACTOR shall have a history of at least five years of pressure testing and grouting sewers.

B. All work shall be supervised by a foreman having previously performed pressure testing and chemical grout sealing of a minimum of 3000 sewer pipeline joints and 250 lateral tap connections.

1.5 SUBMITTALS

A. Grout information:

1. Description of chemical grout.
2. Grout mixture ratio (including additives). Include procedure for adjusting grout mixture for variations in ambient temperatures and changes of temperature of grout through hoses exposed to atmosphere.
3. Curves of grout gel time versus temperature.
4. Instructions for addition of agents.
5. MSDS sheets.

B. Equipment operating procedures and systems to be used, including manufacturer's literature on grout pumps, operating pressures, packers, and lateral blockage clearing equipment.

C. Annular space between the packers and host pipe.

D. Upon completion of grouting each reach, submit to ENGINEER a report showing the following data for each joint tested, grouted or attempted to be grouted.

1. Stationing.
2. Time, date, and temperature.
3. Grout mixture formation, including additives and catalyst mixture formulation and proportion of each.
4. Pumping pressure.
5. Gel time.
6. Quantity of grout used to seal the joint.
7. Step grouting, if applicable.
8. Post-grout pressure test results.
9. Regrouting and retesting giving above data as required.

10. Video recording cross-reference index.

E. Documentation of Post-construction Inspection and Warranty Inspection in accordance with Section 33 01 30.16, Television Inspection of Sewers.

PART 2 - PRODUCTS

2.1 GENERAL

A. All grout materials must have the following characteristics:

1. While being injected, the grout must be able to react /perform in the presence of water (groundwater).
2. The cured grout must withstand submergence in water without degradation.
3. The resultant grout formation must prevent the passage of water (infiltration) through the pipe joint.
4. The grout, after curing, must be flexible, under both dry and wet conditions.
5. The grout must not be biodegradable.
6. The cured grout should be chemically stable and resistant to acids, alkalis, and organics found in sewage.
7. Residual grout shall be easily removable from the sewer line to prevent blockage of the sewage flow.
8. Materials shall be capable of being pumped through a minimum of 500 feet of ½ to ¾ inch diameter hose.

B. Handle, formulate, and store grout in accordance with the manufacturer's recommendations. The uncured grout shall be delivered to the Site in unopened containers with the date of manufacture clearly indicated. Do not utilize uncured grout manufactured more than six months prior to the date of application. Immediately remove from the Site any uncured grout compound determined to be more than six months old. Once a container of uncured grout has been opened it shall be used within 72 hours.

C. All material shall be clearly dated by the manufacturer. ENGINEER shall be provided the opportunity to inspect the CONTRACTOR'S storage facilities at any time. Any material found to have exceeded its shelf life or found to be stored under improper temperature and humidity conditions, as determined by manufacturer's recommendation, shall be marked rejected, shall not be used, and shall be removed from the Site immediately.

D. Mix and handle the grout and the constituents producing it, which may be toxic on contact or inhalation, as recommended by the manufacturer and to minimize hazard to personnel. Provide appropriate protective measures to ensure that the grout components and the chemicals produced in mixing are under the control of the CONTRACTOR at all times and are not available to unauthorized personnel or others. Dispose of excess grout resulting from sewer grouting operations in a safe manner. All equipment and material shall be subject to the review of ENGINEER.

E. All grout materials used shall meet the following minimum application requirements:

1. All component materials shall be easily transportable by common carriers.
2. Packing of component materials shall be compatible with field storage requirements.
3. Grout components shall be packed in such a fashion as to provide for maximum worker safety when handling the materials and minimize spillage when preparing for use.
4. Mixing of the components shall be compatible with field applications and not require precise measurements.
5. The concentration of the grout and additives shall be within the limits recommended by the manufacturer.
6. Catalyzation shall take place at the point of injection/repair.
7. Cleanup shall be done without inordinate use of flammable or hazardous chemicals.

F. Prohibitions

1. Do not use this method to attempt repair of longitudinally cracked pipe, structurally unsound pipe, flattened, or out-of-round-pipe.

2.2 SYSTEM DESCRIPTION

A. Grouting equipment shall consist of two separate pumping systems capable of supplying an uninterrupted flow of sealing materials to completely fill the voids. The gel side of the system shall be a closed system to minimize exposure to moisture. Pumps, fittings, and hoses shall be designed to transport a high viscosity material and shall not be affected by acetone or ketone solvents. The sizing of the system shall be such that the water side can transport materials at 1 to 1 or 8 to 10 times the ratio of the gel side. Pumps shall be sized to deliver a minimum of 3 gpm.

B. Grout shall pass from the pumping system through instant reading, controlled flow meters and then through a dual hose system into the sealing device. The device (referred to hereafter as a packer) shall be a cylindrical case of a size less than pipe size, with the cables at either end used to pull it through the line. The packer device shall be constructed in such a manner as to allow a restricted amount of sewage to flow at all times.

C. Generally, the equipment shall be capable of performing the specified operations in sewers where flows do not exceed 25 percent of pipe diameter.

D. For mainline joint packers, air impervious inflatable sleeves shall be mounted over the cylinder with the ends of the sleeve sealed to the ends of the casing. The sleeves shall be so constructed that they can be pneumatically expanded from the center to both ends. The center portion of the sleeve shall be sealed to the casing by a broad confining band. When the packer is inflated, two widely spaced annular bladders shall be formed, each having an elongated shape and producing an annular void around the confined portion of the sleeve. The central portion of the packer (between the ends) shall be expandable in order to reduce the amount of wasted grout in the void area. No sealing device which is expanded mechanically nor where the expansion sleeve is not continuous will be allowed in order to prevent damage to the pipe from excessive amounts of sealing pressures or air leakage in the center area of such sealing device. Only low void packers with annular space less than ¼ gallon shall be used.

E. Tap and lateral service sealing shall be accomplished using the lateral grouting plugs and push packers specified in Section 33 01 30.65, Pressure Testing of Sewer Pipe Joints and Tap Connections.

F. Provide back-up bladders for all packers on-site any time grouting work is being conducted. Equipment for cleaning lateral blockages shall be present on-site while any grouting work is being conducted.

2.3 GROUTS

A. Acrylamide base grout shall have the following characteristics:

1. A minimum of 12% acrylamide base material by weight in the total grout mix. A higher concentration of acrylamide base material may be used to increase strength or offset dilution during injection.
2. The ability to tolerate some dilution and react in moving water during injection.
3. A viscosity of approximately 2 centipoise, which can be increased with additives.
4. A constant viscosity during the reaction period.
5. A controllable reaction time from 10 seconds to 1 hour.
6. A reaction (curing) that produces a homogenous, chemically stable, non-biodegradable, firm, flexible gel.
7. The ability to increase mix viscosity, density and gel strength by the use of additives.

2.4 ADDITIVES

A. Latex

1. For mainline joint grouting, add latex additive (or equal) to increase compressive and tensile strength of acrylymide grouts to protect against shrinkage and strengthen the grout. Latex shall not contain any organic solvents. The quantity of latex added shall be 3 gallons for every 30 gallons of grout and shall take the place of the same volume of water normally added in a non-latex grout batch on the A Tank (grout tank), unless otherwise recommended by the manufacturer and approved by ENGINEER. Do not add latex to grout used for grouting laterals. Follow manufacturer's recommendations for product handling and mixing. Latex additive shall have the following characteristics.

Solids Content	49% minimum	ASTM D-1010
Viscosity	130 cps @ 77ºF	ASTM D-1638
Solvent	Water	

B. Root Inhibitor

1. Add a root deterrent chemical such as dichlobenil to the grout in proportions as recommended by the manufacturer.

C. Freeze/Dehydration Inhibitor

1. Use a freeze/dehydration inhibitor in proportions recommended by the manufacturer. .

D. Dye

1. Add a fluorescent yellow dye to one grout tank and blue fluorescent dye to the other for all grouts not containing latex additive so that a visual residual layer of grout remains to provide confirmation that the void was filled during sealing.

E. Gel Time Modifier

1. Add gel time extending agent in accordance with the manufacturer's recommendations to extend gel time as necessary.

PART 3 - EXECUTION

3.1 GENERAL

A. Remove roots and test joints and laterals in accordance with Section 33 01 30.65, Pressure Testing of Sewer Pipe Joints and Tap Connections.

B. Grout all joint and transitions that failed the pressure test by the injection method or equal. Generally, this shall be accomplished by forcing grout through a system of pumps and hoses into and through the joints of the sewer from the packer within the sewer pipe. Jetting or driving pipes from the surface shall not be allowed. Do not uncover the pipe by excavation except where specifically shown on the Drawings or called for in the Specifications.

C. Remove excess grout from pipe and laterals. Excess grout shall be defined as a thickness of grout greater than 1" thick at any point or an amount of grout that, given its location, size and geometry, in the judgment of the ENGINEER, could cause a blockage. Flush or push forward to the next downstream manhole, remove from the sewer system, and properly dispose of excess grout. In no case shall excess grout material be allowed to accumulate or flushed down the sewer.

D. All decisions regarding allowable roots or excess grout shall be made in the field during the work by the ENGINEER and shall be final. It is the CONTRACTOR'S responsibility to either remove all grout and roots or obtain ENGINEER approval in writing to leave them in place.

E. Any structurally undamaged joint that structurally fails (breaks) during testing and grouting that are documented on video to have been done under normal pressure conditions shall be the OWNER's responsibility and cost to repair. Grout all circumferential cracks and fractures in pipe. Do not grout any other pipe defects unless directed by ENGINEER to do so. Any structurally failed pipe or joint that is grouted at the ENGINEER's direction that further fails/breaks during testing and grouting that are documented on video to have been done under normal pressure conditions shall be the OWNER's responsibility and cost to repair. Promptly repair any sewer damage resulting from the CONTRACTOR's operations at no additional compensation.

3.2 SEWER FLOW CONTROL

A. During grouting, provide sewer flow control so as to provide unimpeded view of the packer.

3.3 GROUT PREPARATION

A. Mix all grout at the Site in the presence of the ENGINEER. Do not use grout that has been mixed off-Site and is in the CONTRACTOR'S tank when the truck arrives on Site. Follow the manufacturer's recommendations for the mixing and safety procedures to protect personnel from any adverse effects of the grouting compounds. Add and mix powder and additives at rates that will eliminate the formation of lumps within grout tanks solutions. Use accurate scale(s) to weigh the various non-water grout solution components. Thoroughly mix all additives in the grouting component tanks. Provide accurate thermometers to verify temperature of grouting components in tanks.

B. At the beginning of each day, prior to application of grout, perform a pump test to determine if proper ratios are being pumped from the grout component tanks at the proper rates and to measure pump rates. Use separate containers to capture the discharges from the grout component tanks. Take corrective action if unequal quantities are being pumped. Repeat the pump test until equal quantities are pumped from the grout tanks. Pump one gallon of grout and count the pump strokes to confirm the number of pump strokes required to achieve the delivery rate. Repeat the pump test until proper ratios and delivery rates are pumped from the grout tanks.

C. At the beginning of each day, when new batches of grout are mixed, when grout additives are modified to change gel times and at the beginning of any new pipe segment or manhole, whenever the temperature in the tanks or ambient temperature have changed by more than 10°F from the previous gel test, perform a grout gel test in the presence of the ENGINEER to determine the grout mixture gel time by collecting a sample of grout from the packer discharge.

D. Add gel time extending agent, as necessary and in the presence of the ENGINEER, to compensate for changes in temperature in grout component tanks or hoses. The addition of dilution water to extend gel times is not acceptable unless resulting base material exceeds 12% by weight.

E. During the grouting process, the CONTRACTOR and ENGINEER shall monitor the grout component tanks to make sure that proper ratios are being pumped. If unequal levels are noted in the tanks, repeat the pump test as described above.

F. Gel times shall be within 5 seconds of the following unless otherwise approved by ENGINEER.

$$Gel\ Time = \left(\frac{\{Volume\ of\ Annular\ Space\ (gal)\} + \{PipeDiameter(inch)/4\}}{Pumping\ Rate(gpm)} \right) \left(\frac{60\,\text{sec}}{1\,\text{min}} \right) + 10\ \text{seconds}$$

3.4 PIPE JOINT SEALING BY PACKER INJECTION GROUTING FOR MAINLINE SEWERS AND LATERALS CONNECTED TO MANHOLES

A. Position the mainline packer over the joint or defect to be sealed by means of a closed circuit television camera in the line. Position the lateral packer over the joint or defect to be sealed by a means of visual observation, marked push rod, or where a cleanout is available, through a closed-circuit television camera in the lateral. For push packers start work from most upstream point to be grouted. Make accurate measurement of the location of the defect to be sealed using a portion of the packer as a point of reference for positioning the injection area of packer over the defect.

B. Pneumatically expand the packer sleeves such that they seal against the inside periphery of the pipe to form a void area at the joint now completely isolated from the remainder of the pipe line.

C. Pump grout materials into this isolated area. Run the pump continuously until refusal with the goal of applying ¼ gallon to ½ gallon of grout per inch-diameter of pipe joint. Refusal shall mean the mixed grout has flowed through any joint failure, through any annular space, and into the surrounding soil; gelled or filled the available void space; and formed a cohesive seal stopping further grout flow. Record the amount of grout pumped on the sealing log.

D. The pump, meter, and packer shall be integrated so that proportions and quantities of materials and pressures for materials and sealing gel can be instantly monitored and regulated in accordance with the type and size of the leak, percentage of voids being filled, type of soil surrounding the pipe, and the rate of flow of the sealing gel solution in relation to the back pressures. These parameters should follow the manufacturer's specifications and guidelines.

E. Upon completion of the injection, deflate the packer to break away the ring of gel formed by the packer void and move the packer at least one packer length in either direction. Move the television camera to a position to observe and inspect the results of the injection. If inspection and/or testing shows the seal was not completely effective, repeat the process.

F. The packer should then be repositioned over the joint, reinflated, and the joint retested at a pressure equal to the initial test pressure. If the joint fails this air test, repeat the grouting procedure at no additional cost to the OWNER. Repeat this sequence of air testing, grouting and subsequent air testing until either the joint is sealed or it is determined that the grout consumption is too high. The final determination to stop subsequent attempts to seal a joint will be made jointly between the ENGINEER and the CONTRACTOR. If necessary, clear the injection port on the packer with a quick burst of air such that the void pressure meter reads zero ± ½ psi. Should the void pressure meter not read zero ± ½ psi, clean the equipment of residual grout or make the necessary equipment repairs/adjustments to produce accurate void pressure readings.

G. If a mainline or lateral joints requires more than 10 gallons of grout, modify grouting procedure to step grouting by pumping additional grout in 4 gallon increments, waiting 1 full minute, retesting, and, if needed, continuing with additional 4 gallon grout steps until successful test or until directed to stop by the ENGINEER.

H. After the final post-grout pressure testing of each joint, move the packer forward, wiping away the excess grout that extends into the pipe, reduces the pipe diameter, or restricts the flow. Leave the sealed joints reasonably flush with the existing pipe surface.

I. Confirm lateral flow after the sealing of each lateral through camera inspection. If a grout blockage is evident, clear the lateral.

J. All sewer pipe joint grouting work performed shall be guaranteed against faulty workmanship and/or materials for a period of one year after the completion of the work.

K. Upon completion of grouting each reach, a report shall be presented to the ENGINEER showing the following data for each joint grouted or attempted to grout:

1. Stationing;
2. Time and date;

3. Grout mixture formation and catalyst mixture formulation and proportion of each reach;
4. Pumping pressure
5. Gel time;
6. Post-group pressure test results;
7. Regrouting and resting giving above data as required; and
8. DVD tape cross reference index.

3.5 LATERAL TAP CONNECTION SEALING BY PACKER INJECTION GROUTING

A. Lateral tap sealing begins if the lateral tap does not pass the air test as described in Section 33 01 30.65, shows evidence of leakage, has been successfully cleaned to remove roots, or where CONTRACTOR has been directed to grout a tap that contains visible roots. The lateral packer shall remain in position during the pressure test, thus maintaining the isolated void. Pressure inject grout through the lateral packer into the annular space between the lateral grouting plug and the lateral pipe. Pump the grout out into the soil through leaking joints and pipe defects and into the annular space between the liner and the host pipe.

B. Pump grout materials into this isolated area. Run the pump continuously until refusal. Refusal shall mean the mixed grout has flowed through any joint failure, through any annular space, and into the surrounding soil; gelled or filled the available void space; and formed a cohesive seal stopping further grout flow, and an 8 psi back pressure is achieved while pumping. If the grout pumped exceeds 1 gallon per foot of lateral bladder plus 3 gallons, it will be suspected that there are significant voids on the outside of the pipe or that the packer is not properly sealed. Check that the packer is sealed properly. If it is, modify grouting procedure to step grouting by pumping additional grout in 4 gallon increments, waiting 1 full minute, retesting, and, if needed, continuing with additional 4 gallon grout steps until successful test or until directed to stop by the ENGINEER. Record the amount of grout pumped on the sealing log.

C. Upon completion of the lateral tap sealing procedure, air test the lateral tap a second time to confirm the sealing of the connection in accordance with the procedure in Section 33 01 30.65. If the lateral tap fails this air test, repeat the grouting procedure at no additional cost to the OWNER. Repeat this sequence of air testing, grouting and subsequent air testing until either the lateral tap is sealed or it is determined that the grout consumption is too high and may result in the blockage of the lateral pipe. The final determination to stop subsequent attempts to seal a lateral tap will be made jointly between the ENGINEER and the CONTRACTOR. Air tests after grouting laterals containing roots is not required.

D. Confirm lateral flow after sealing of each lateral tap. With the lateral packer in position, retract the inversion tube and inject air pressure into the lateral. Should a pressure build in the lateral and not drop to approximately zero immediately after the pressurized air is turned off, move the packer off the connection and view the connection with a television camera. With the camera viewing the connection point, attempt to obtain a water flush by the occupant. If no water is viewed during this procedure, it will be assumed that the building sewer connection is substantially blocked with grout and the CONTRACTOR shall immediately clear the lateral at no additional cost to the OWNER. Blockages in the lateral that are not the result of grouting operations shall not be the responsibility of the CONTRACTOR.

3.6 JOINT SEALING VERIFICATION

A. Record grouting of joints in conjunction with the testing of joints as specified in Section 33 01 30.65, Pressure Testing of Sewer Pipe Joints and Tap Connections. Record the pressure drop continuously on video and in writing immediately before sealing, and immediately after grouting. After the packer is deflated and moved, record on video the visual inspection of the joint.

B. At the completion of the sewer line segment (i.e. manhole to manhole), conduct joint grouting verification testing of grouted joints and laterals for quality control purposes on 5% of the grouted mainline joints (minimum of two repaired joints), 25% of the grouted lateral taps (minimum of one lateral tap and excluding taps with roots not removed), and two joints for each grouted lateral connected to a manhole. ENGINEER may select the joints and laterals to be re-tested. Pressure testing shall be conducted according to Section 33 01 30.65, Pressure Testing of Sewer Pipe Joints and Tap Connections. Within a sewer line segment, if any joints, lateral taps or laterals connected to a manhole in a pipe segment fail the retest after sealing, retest all joints and laterals, as applicable, in the sewer line segment. Perform this post repair testing and any additional testing/sealing required beyond the initial retest area at no additional cost to OWNER.

3.7 DISPOSAL

A. Collect and properly dispose of cleaning solvents used in the cleaning of the grouting equipment. Do not dispose of cleaning solvents into the sewer system or into natural watercourses.

3.8 POST-CONSTRUCTION INSPECTION

A. Conduct Post-Construction Inspection of all pipe, taps, and laterals tested and/or grouted in accordance with Section 33 01 30.16, Television Inspection of Sewers.

3.9 MAINLINE SEWER PIPE JOINT WARRANTY TESTING

A. Conduct warranty testing on all of the joints in 15% of the mainline sewer pipe segments or a minimum of two sewer line segments, whichever is greater, 18 to 24 months after completion of grouting. ENGINEER will select the pipe segments to be warranty tested. Testing shall be pressure testing conducted according to Section 33 01 30.65, Pressure Testing of Sewer Pipe Joints and Tap Connections. Actual period for testing shall be determined by the ENGINEER and will ideally be conducted during high groundwater conditions. CONTRACTOR will be provided with 60 days notice of the warranty testing. Conduct all warranty tests in the presence of the ENGINEER.

B. If more than 10% of the warranty tested joints fail, test an additional 15% of the pipe segments or two additional sewer line segments, whichever is greater, will be warranty tested. If more than 10% of the second group of warranty tested joints fail, test 100% of the joints in the remaining untested pipe segments at no additional compensation.

C. Grout and retest all joints failing warranty testing at no additional compensation.

D. For each pipe warranty tested, perform a Warranty Inspection.

3.10 LATERAL TAP CONNECTION WARRANTY TESTING

A. Conduct warranty testing on 15% of the mainline lateral tap connections (excluding grouted taps that contained roots) 18 to 24 months after completion of grouting. ENGINEER will select the lateral tap connections to be warranty tested. Testing shall be pressure testing conducted according to Section 33 01 30.65, Pressure Testing of Sewer Pipe Joints and Tap Connections. Actual period for testing shall be determined by the ENGINEER and will ideally be conducted during high groundwater conditions. CONTRACTOR will be provided with 60 days notice of the warranty testing. Conduct all warranty testing in the presence of the ENGINEER.

B. If more than 10% of the warranty tested lateral tap connections fail, test an additional 15% of the lateral tap connections. If more than 10% of the second group of warranty tested lateral tap connections fail, test 100% of the remaining, untested, lateral tap connections at no additional compensation.

C. Grout and retest all lateral tap connection joints failing warranty testing at no additional compensation.

D. Perform a Warranty Inspection of all lateral taps that are warranty tested.

++END OF SECTION++

SECTION 33 01 30.65

PRESSURE TESTING OF SEWER PIPE JOINTS AND TAP CONNECTIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all labor, materials, tools, equipment and incidentals as shown, specified, and required for testing sewer pipe joints by hydraulically applying a positive pressure to the joints, monitoring the pressure in the void and monitoring the test medium flow rate. The test medium shall be air.

B. The intent of joint testing is to identify those sewer pipe joints that are not watertight and that can be successfully sealed by packer injection grouting.

C. Test all joints in a mainline segment (all pipelines which extend from manhole to manhole).

D. Test lateral tap connections to the sewer main.

1.2 REQUIREMENTS:

A. This Contract requires work in active sewers. Follow all federal, state and local requirements for safety in confined spaces.

1.3 RELATED SECTIONS

A. Section 01 41 28, Confined Space Entry Permit

B. Section 01 51 41, Temporary Pumping

C. Section 33 01 30.16, Television Inspection of Sewers

D. Section 33 01 30.41, Cleaning of Sewers

E. Section 33 01 30.43, Removal of Protruding Service Connections

F. Section 33 01 30.61, Packer Injection Grouting

G. Section 33 01 30.74, Cured-in-Place Lateral Lining

1.4 QUALIFICATIONS

A. CONTRACTOR shall have a history of at least five years of pressure testing and grouting sewers.

B. All Work shall be supervised by a foreman having previously performed pressure testing and chemical grout sealing of a minimum of 3,000 sewer pipeline joints and 250 lateral tap connections.

1.5 SUBMITTALS

A. Equipment operating procedures and systems.

B. Test Records. Submit complete records collected during the joint testing activities, identifying the following:

1. Location of the pipeline segment in which the testing is being done.
2. Location of each joint tested.
3. Location of any joints not tested and the reason for not testing.
4. Test pressure achieved and the duration of test maintained for each joint passing the air test.
5. Retest test pressure for each joint passing air test after the application of grout.

C. Documentation of Joint Testing Observations in accordance with Section 33 01 30.16, Television Inspection of Sewers.

D. List and corresponding digital images, in accordance with Paragraph 3.2, of lateral taps containing roots.

1.6 REFERENCE STANDARDS

A. National Association of Sewer Service Companies (NASSCO) prepared *Pipeline Assessment and Certification Program (PACP)*, Version 6.01 – November 2010. This manual includes a standard TV inspection form and sewer condition codes.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. The basic equipment used for mainline pipe joints and for laterals connected to the mainline shall consist of a remotely operated television camera capable of pan and tilt, joint testing device such as a packer, and test monitoring equipment. The equipment shall be constructed in such a way as to provide means for introducing air under pressure into the void area created by the expanded ends of the joint testing device and a means for continuously measuring the actual static pressure of the test medium within the void area only. See additional system requirements in Section 33 01 30.61, Packer Injection Grouting.

B. The device for testing lateral tap connections shall consist of inflatable mainline end elements and a lateral grouting plug that creates a void area extending beyond the tap connection. Whenever possible, use a lateral grouting plug sized to match the diameter of the lateral being grouted with an effective sealing length suitable to seal the lateral tap connection at the main. If the lateral transitions from 6” to 4” in diameter, use a 4” lateral grouting plug, but no relief for excess residual grout will be provided. Maintain a variety of lengths of lateral grouting plugs and adjust length of lateral grout plug as required to grout capped laterals. The device shall provide a means for continuously measuring the static pressure of the test medium and chemical grout within the void area created by the inflation of the device. All pressure measurements shall be made within the void area.

C. Void pressure data shall be transmitted electronically from the void area to the monitoring equipment. All test monitoring shall be carried out in the TV studio as described in Section 33 01 30.16, Television Inspection of Sewers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Testing will not be required on pipe exhibiting the following conditions or characteristics. Provide ENGINEER with digital image and intention not to grout any such defect.

1. Longitudinally fractured or broken pipe, as classified by PACP, or on sections of the pipe between joints.
2. Any section of pipe that is scheduled to receive a cured-in-place point repair.
3. Any section of pipe that is scheduled for replacement or other work involving excavation or new connections.
4. Any sections of pipe or joints that are in such poor structural condition that in the judgment of ENGINEER and CONTRACTOR, significant structural damage of the pipe would occur as a result of the pressure test.

B. Clean sewer and remove all roots in mainline sewer except minor hair roots prior to testing in accordance with Section 33 01 30.41, Cleaning of Sewers.

C. Attempt to test and, if needed, grout any joint separated less than 1-inch. For joints separated by more than 1-inch, the ENGINEER may direct the CONTRACTOR to install a cured in place spot repair (CIPSR) to bridge the separated joint. ENGINEER may also direct CONTRACTOR to install a CIPSR on joints separated by less than 1-inch that fail an air test.

D. Attempt to test and, if needed, grout any small or medium offset joint as classified by PACP. For offset joints that are classified as large offset by PACP, the ENGINEER may direct the CONTRACTOR to install a CIPSR to bridge the joint. ENGINEER may also direct CONTRACTOR to install a CIPSR on any offset joints that fail an air test.

E. In accordance with Section 33 01 30.43, Removal of Protruding Service Connections, cut back or otherwise remove any laterals that protrude more than 5/8 inch into the mainline to avoid interference with the testing and sealing equipment. Confirm the inside diameter of the lateral pipe to be tested and apply the appropriate packer.

F. Perform testing of joints only in the presence of the ENGINEER.

G. During joint testing and sealing, provide sewer flow control so as to provide unimpeded view of the packer.

H. Record the testing procedure, as defined in Section 33 01 30.16, Television Inspection of Sewers. The recording shall show the location of the joint and the test pressure in subtitles. Sealing of the failed joints will be incorporated on the same recording.

3.2 DOCUMENTATION OF ROOTS IN LATERAL TAPS

A. During mainline sewer cleaning or joint testing, document all lateral taps containing roots that are either (a) greater than fine roots or (b) of a nature to prevent testing and sealing of tap connection. For each such tap connection, submit a screen shot image clearly showing the extent of roots. Submit images in electronic format, labeled and organized in a manner to easily retrieve the image for the lateral tap in question. The list of lateral taps with roots shall include upstream and downstream manhole numbers, station, property address served, plan sheet number where tap is located and photograph of outside cleanout, if present.

B. There is no requirement to document roots in laterals connected to manholes.

3.3 JOINT TESTING PROCEDURE FOR MAINLINE SEWER

A. Joint testing pressure shall be equal to ½ psi per vertical foot of pipe depth plus 2 psi; however, test pressure shall not exceed 10 psi without the approval of the ENGINEER.

B. Individually test each sewer pipe joint which is not visibly leaking at a rate classified as running or greater by PACP at the above-specified pressure (and retest after sealing) in accordance with the following procedure:

1. Air Test Procedure

   a. The packer or testing device shall be positioned within the pipe in such a manner as to straddle the joint to be tested.

   b. The packer ends or testing device ends shall be expanded so as to isolate the joint from the remainder of the pipe and create a void area between the packer and testing device and the pipe joint. The ends of the testing device shall be expanded against the pipe with sufficient inflation pressure to contain the air within the void without leakage past the expanded ends. If all attempts to isolate the joint fail, pump grout in an attempt to seal the leak around the packer end. The CONTRACTOR shall be paid the unit price for grout to seal the packer unless the ENGINEER determines that the sewer was inadequately cleaned or the packer is not performing properly, but will not be paid the unit price for joint grouting for this activity.

   c. Air shall then be slowly introduced into the void area until a pressure equal to or greater than the required test pressure, but in no cases greater than 2 psi above the required test pressure, is observed on the pressure monitoring equipment.

d. After the void pressure is observed to be equal to or greater than the required test pressure, the air flow shall be stopped. If the void pressure decays by more than 1.0 psi within 30 seconds, the joint will have failed the test and shall be sealed as specified in Section 33 01 30.61, Packer Injection Grouting.

C. Upon completing the testing of each individual joint, the packer shall be deflated with the void pressure meter continuing to display void pressure. Should the void pressure meter fail to drop to zero, clean the test equipment of residual grout material or make the necessary equipment repairs to provide for an accurate void pressure reading.

3.4 LATERAL TAP TESTING PROCEDURE

A. Lateral tap joint testing pressure shall be equal to ½ psi per vertical foot of pipe depth plus 2 psi; however, test pressure shall not exceed 10 psi without approval of the ENGINEER.

B. Air testing lateral taps shall be accomplished by isolating the area to be tested with the lateral tap packer and by applying positive pressure into the isolated void area. A pan and tilt camera shall be used to position the lateral packer for laterals directly connected to the mainline sewer. The lateral bladder shall be inverted from the mainline assembly into the lateral pipe and inflated. The mainline elements shall then be inflated to isolate the lateral connection and the portion of the lateral to be tested. Direct visual observation and measured cable lengths shall be used to position the lateral packer for laterals directly connected to manholes. A sensing unit shall be located within the void area and will accurately transmit continuous pressure readout to the control panel.

C. The test procedure will consist of applying air pressure into each isolated void area. A sensing unit shall be located within the void area and will accurately transmit continuous pressure readout to the control panel. Air shall then be slowly introduced into the void area until a pressure equal to or greater than the required test pressure, but in no cases greater than 2 psi above the required test pressure, is observed on the pressure monitoring equipment. Once the designated pressure in the isolated void is displayed on the meter of the control panel, the application of air pressure will be stopped and a twenty-second waiting period will commence. The void pressure will be observed during this period. If the void pressure drop is greater than 1.0 psi, the lateral shall be considered to have failed the air test and shall be grouted and retested in accordance with Section 33 01 30.61, Packer Injection Grouting.

D. After completing the air test for each individual lateral specified herein, deflate the lateral packer, with the void pressure meter continuing to display void pressure. If the void pressure does not drop to approximately zero, the equipment shall be adjusted to provide a zero void pressure reading at the monitor.

3.5 CONTROL TEST

A. Prior to starting the joint testing phase of the Work, demonstrate the acceptable performance of air test equipment in the presence of the ENGINEER by conducting demonstration tests daily, or more frequently as directed by the ENGINEER.

1. For pipe less than or equal to 18 inches in diameter, provide a straight pipe of appropriate diameters and sufficient length to test mainline packers and lateral push packers and a wye tap mockup of appropriate diameters and sufficient length to test the lateral tap connected to mainline packer. All of these test devices shall be fitted with a $1/8^{th}$ inch diameter tap hole with a plug or screw that can be removed to test the packer under both sound and leaking conditions. For pipe greater than 18 inches in diameter, the below method shall be used.

2. After entering each pipeline segment with the test equipment, but prior to the commencement of joint testing, position the test equipment on a section of sound sewer pipe between pipe joints, and perform a test as specified. The equipment shall hold a 10 psi test pressure for a period of 60 seconds with a pressure drop of less than 1 psi. In the event of a failed test, repair any defective equipment and re-test to verify proper operation of all equipment at no additional compensation. Should it be found that the barrel of the sewer pipe will not meet the joint test requirements, then the performance testing shall be waived or modified as determined by the ENGINEER.

3. If air testing equipment cannot be performed successfully, repair or otherwise modify air test equipment and repeat the tests until the results are satisfactory to the ENGINEER. This test may be required at any other time during the performance of joint testing work if the ENGINEER suspects the testing equipment is not functioning properly.

+ + END OF SECTION + +

SECTION 33 01 30.72

CURED-IN-PLACE PIPE LINING – STEAM CURED

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all materials, equipment, labor and incidentals for the installation and testing of cured-in-place pipe lining (CIPPL) within the sewer main.

B. The sewer main CIPPL process shall consist of inserting a resin-impregnated flexible tube into an existing sewer, expanding the tube out against the sewer pipe, and curing the tube to form a pipe liner. Curing shall be accomplished by circulating heated water or steam to affect the desired cure throughout the tube extending full length from manhole to manhole.

C. The CIPPL shall cure into a hard, impermeable liner pipe of the specified thickness and form a structurally sound liner pipe with a uniformly smooth interior.

1.2 RELATED SECTIONS

A. Section 01 35 14, Notification Procedures

B. Section 01 51 41, Temporary Pumping

C. Section 01 41 28, Confined Space Entry Permit

D. Section 33 01 30.16, Television Inspection of Sewers

E. Section 33 01 30.41, Cleaning of Sewers

F. Section 33 31 71, Sanitary Sewer Service Reconnections

1.3 REFERENCES

A. Standards referenced in this Section are listed below:

1. ASTM C581-03 - Standard Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass-Fiber-Reinforced Structures Intended for Liquid Service.
2. ASTM D543-06 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
3. ASTM D638-03 – Standard Test Method for Tensile Properties of Plastics.
4. ASTM D790-07 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
5. ASTM D2583-07 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
6. ASTM D2990-01 - Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.

7. ASTM D3567-97(2006) – Standard Practice for Determining Dimensions of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings.
8. ASTM D5813-04 – Standard Specification for Cured-In-Place Thermosetting Resin Sewer Pipe.
9. ASTM F1216-07B – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
10. ASTM F2019-03 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP).
11. DIN EN 761 – Glass Reinforced thermosetting plastics (GRP) pipes.
12. DIN EN 13566-4 – Plastics piping systems for renovation of underground non-pressure drainage and sewerage networks.
13. ISO 178- Determination of Flexural Properties
14. WRc Sewerage Rehabilitation Manual, Type II Design, 4th Edition, 2001.

1.4 QUALIFICATIONS

A. CONTRACTOR shall be licensed and certified by the manufacturer for the mainline CIPPL process and have a history of at least five years of performing CIPPL type work. CONTRACTOR shall also have previously installed a minimum of 50,000 linear feet of CIPPL for the mainline CIPPL manufacturer proposed. A manufacturer's representative with direct control of the lining process may be used to meet this experience requirement.

B. All work must be supervised by a foreman having previously installed a minimum of 15,000 linear feet of CIPPL for the mainline CIPPL manufacturer proposed. A manufacturer's representative with direct control of the lining process may be used to meet this experience requirement.

C. The entity performing the wet-out of the CIPPL shall have previously performed this type of work for a minimum of two years and previously wet-out at least 250,000 linear feet of 8-inch to 21-inch diameter CIPPL.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Care shall be taken in shipping, handling and storage to avoid damaging the liner. Extra care shall be taken during cold weather construction. Any liner damaged in shipment shall be replaced as directed by the OWNER at no additional cost to OWNER.

B. While stored, the CIPPL shall be adequately supported and protected. CIPPL shall be stored in a manner as recommended by the manufacturer and as approved by the ENGINEER.

1.6 QUALITY CONTROL

A. Though the process may be licensed, no change of material, design values, or procedures may be made during the course of the Work without the prior written approval of the ENGINEER.

B. All mainline CIPPL liners shall be provided by a single manufacturer and installed by a single installer. The supplier shall be responsible for conforming to all test requirements specified herein as applicable. In addition, all liner to be installed under this Work may be inspected at the plant for compliance with these specifications by an independent testing laboratory provided by the OWNER., at its own expense. The CONTRACTOR shall require the manufacturer's cooperation in these inspections. The cost of plant inspection will be the responsibility of the OWNER.

C. All liners to be installed under this Work may be inspected at the manufacturer plant(s) and wet-out facility for compliance with these Specifications by OWNER or ENGINEER. The CONTRACTOR shall require the wet-out facility's cooperation in these inspections. The cost of inspection will be the responsibility of the OWNER.

D. At the time of manufacture, each lot of liner shall be inspected for defects and tested in accordance with applicable ASTM standards. At the time of delivery, the liner shall be homogeneous throughout, uniform in color, free of cracks, holes, foreign materials, blisters, or deleterious faults.

E. For testing purposes, a production lot shall consist of all liner having the same marking number. It shall include any and all items produced during any given work shift and must be so identified as opposed to previous or ensuing production.

F. CONTRACTOR shall have a Quality Control Plan or Procedure in place that will allow the ENGINEER to monitor the resin impregnation process.

G. The ENGINEER may at any time direct the Manufacturer and the CONTRACTOR to obtain compound samples and prepare test specimens in accordance with the applicable ASTM standards. The CONTRACTOR shall provide certified test results of the short-term properties, including wall thickness and flexural strength, of the cured lining material from the actual installed liner at a minimum of one location per each liner insertion setup. Samples of the installed liner shall be prepared and tested by an independent, certified ISO 17025 testing facility approved by the ENGINEER. The cured liner samples shall be tested for flexural strength and flexural modulus in accordance with ASTM F1216, ASTM D790, ASTM D638 and ASTM D2990. The samples of the installed liner shall meet or exceed the physical properties stated in this specification. Conformance certification shall be submitted to the ENGINEER for approval as part of the acceptance requirements.

1.7 WARRANTY

A. All lining work shall be fully guaranteed by the CONTRACTOR for a period of 5 years from the date of Final Acceptance unless otherwise stipulated in writing by the OWNER prior to the date of Conditional Acceptance. During this period, all

defects discovered by the OWNER or ENGINEER shall be addressed by the CONTRACTOR in a satisfactory manner at no cost to the OWNER. In addition to the Warranty Inspection specified under Paragraph 3.9, the OWNER may conduct independent inspections, at its own expense, of the lining Work at any time prior to the completion of the guarantee period.

1.8 SUBMITTALS

A. Submittals shall conform to the requirements of Section 01 33 00, Submittal Procedures.

B. Notices to customers whose sewer service will potentially be interrupted.

1. Notice to be distributed 1 week prior to service interruption.
2. Second notice to be distributed 48 hours prior to service interruption.
3. Third notice immediately prior to disruption of service.
4. Notices shall include at a minimum the date of notice distribution, the date and times of cured-in-place pipe lining construction, a description of construction and limitation to water use, and three contact numbers of the CONTRACTOR for emergencies.

C. Cured-In-Place Pipe:

1. Summary table of CIPP material properties, including short-term flexural modulus of elasticity, 50-year flexural modulus of elasticity, short-term flexural strength (bending stress), 50-year flexural strength (bending stress), chemical resistance, and hardness. Certified test reports shall be submitted verifying each value as described below

2. Independent third party certified laboratory test reports demonstrating that the exact resin/liner combination to be used for this project meets the requirements for initial structural properties (performed in accordance with ASTM F1216, ASTM D638 and ASTM D790) and chemical resistance (performed in accordance with ASTM F1216-Appendix X2 or ASTM D5813). If the architecture of the CIPP is such that the physical properties vary depending on the direction of testing (i.e., axial versus circumferential), submit test data on both directions in accordance with the test methods listed above in this paragraph.

3. Independent third party certified laboratory test reports demonstrating that the exact resin and liner to be used for this project has been tested for long-term flexural modulus of elasticity and long-term flexural strength (i.e. 10,000 hour minimum creep testing performed in accordance with ASTM D2990 for design conditions applicable to this project). When filled resins are proposed, complementary data of the same data for unfilled resin shall also be provided. If the architecture of the CIPP is such that the physical properties vary depending on the direction of testing (i.e., axial versus circumferential), submit test data on both directions in accordance with the test methods listed above in this paragraph. If the data submitted is not for the exact liner to be used on this project, submit a detailed description of the physical properties of

both the liner used in the test and the liner to be used for this project to demonstrate that the two liners are comparable in terms of physical properties.

a. Test will be performed for a minimum of 10,000 hours under test conditions and loadings described below. The data points from 1,000 hours to 10,000 hours, or such other time period as determined by the ENGINEER based on the curve or slope of the plotted data, of the Long-term Flexural Modulus and Long-Term Flexural Strength shall be extrapolated using a Microsoft Excel log-log scale linear regression analysis to determine the minimum service life performance of the resin-tube.

b. Testing will be conducted at:

   i. Temperature: 21 to 25°C

   ii. Relative humidity: 50% minimum

   iii. Load: Load shall be equivalent to a load that is 25% of the yield stress as measured by ASTM D790, or as approved by ENGINEER.

c. If non-round host pipes (ovality greater than 10%) are to be rehabilitated and if the architecture of the CIPP is such that the physical properties vary depending on the direction of testing (i.e., axial versus circumferential), only ASTM D2990 test results on a specimen prepared in accordance with ASTM D790 will be accepted; no other testing methodology for long-term creep will be accepted.

4. The name of the liner and resin manufacturer, the location of the facility where each was manufactured, and a list of appurtenant materials and accessories to be furnished.

5. Structural design calculations and specification data sheets listing all parameters used in the liner design and thickness calculations based on Appendix X1 of ASTM F1216 for each pipe segment with less than 10% ovality or based on the WRc Sewerage Rehabilitation Manual, Type II Design, Section 5.3.2.iii for non-round pipe or circular pipes with greater than 10% ovality. All calculations shall be prepared under and stamped by a Professional Engineer registered in the State of Massachusetts. Submit P.E. Certification Form for all CIPPL design data.

6. The Quality Control report for the wet-out facility that ensures proper materials and amounts are used in the resin impregnation process and in liner shipping and storage. At a minimum, the Quality Control report should include, for each CIPP segment, resin lot numbers, volumes of resin, catalyst, and enhancers, date of wet-out, and storage and transportation controls and quality assurance procedures. Include a checklist so that each critical step in the resin impregnation process is checked off and initialed.

7. Installation and quality control plan, including bypass pumping plans, mainline sewer cleaning plan and cleanliness requirements, liner shot plan and sequence, liner installation standard procedures (including, but not limited to, minimum and maximum allowable installation pressures and speeds, and minimum and maximum allowable curing temperatures, pressures, and curing durations and speeds, all certified by the resin and tube manufacturers), intermediate manhole exposed liner restraining method, boiler sizing calculations, light train sizing, temperature monitoring plan, odor controls procedures, and plan to manage flow to/from laterals during lining.
8. Curing schedule for each shot, including heating, curing, and cool-down schedules.
9. Available standard written warranty from the manufacturer of wet-out liner.

D. Material and method of installation for hydrophilic end seals and pre-liners.

E. Contingency Plan, including methods and equipment to be used to repair unacceptable liner defects and for removing failed liners, and for availability and accessibility of backup equipment such as air compressors and lateral reinstatement cutters.

F. Documentation of Pre-Construction Inspection, Post-construction Inspection and Warranty Inspection in accordance with Section 33 01 30.16, Television Inspection of Sewers.

G. Curing log of CIPPL temperatures and pressures at the upstream and downstream manholes during the curing process to document that proper temperatures, pressures and cure times have been achieved. Curing log shall list as a minimum the temperature of the hot water, steam and/or interior of the liner, the temperature of external thermocouples, pressures, and rate of travel of the ultraviolet assembly (for UV-cured CIPPL) at least once every five minutes or as recommended by the resin and tube manufacturers, whichever is more frequent.

PART 2 – PRODUCTS

2.1 DESIGN REQUIREMENTS

A. The CIPPL lining shall be a resin-impregnated, flexible polyester felt, or equivalent material tube which is inserted into the sewer to be rehabilitated and cured-in-place by an acceptable curing method. The tube shall have a suitable polyurethane membrane coating for protection of the interior surface and to provide a uniform, smooth flow surface. When installed, there shall be no film or plastic membrane between the existing inner sewer surface and the resin filled felt liner. The resin shall be a liquid thermosetting resin and shall be suitable for the design conditions as well as the curing process.

B. CIPPL Properties:

1. The installed CIPPL after curing shall meet the minimum structural properties listed below:

Property	Reference	Short Term Minimum Value	Long Term Minimum Value (50 year)
Flexural Strength	ASTM D790	4,500 psi	2,500 psi
Flexural Modulus	ASTM D790	300,000 psi	175,000 psi*

*With no greater than a 60% reduction from the initial strength

C. CIPPL Thickness:

1. The required structural CIPPL wall thickness shall be based, as a minimum:

   a. In accordance with ASTM F1216, Appendix X1, Design Considerations for a fully deteriorated or partially deteriorated host pipe, for a circular host pipe with 10% ovality or less.

   b. In accordance with WRc Sewerage Rehabilitation Manual, Type II Design, Section 5.3.2.iii for non-round pipe or circular pipes with greater than 10% ovality as indicated in the Lining Summary at the end of this Section.

   c. A safety factor of 2.

   d. A minimum service life of 50 years under continuous service.

   e. A modulus of soil reaction of 700 psi.

   f. A soil density of 120 lbs/ft^3.

   g. A Poisson's ratio of 0.3.

   h. An enhancement factor of 7.

   i. Design shall be based on a groundwater elevation at grade.

2. The flexural modulus and flexural strength used in the design shall be the values as rated for the specified service life and as submitted in Paragraph 1.8.A. When filled resins are proposed, complementary data of the same data for unfilled resin shall be provided.

3. The liner thickness of each pipe segment shall be determined by the CONTRACTOR and submitted per Paragraph 1.8 of this Section.

D. Verify that installed thickness of the CIPPL is within minus 5 percent and plus 10 percent of the design thickness. Accurately measure the installed thickness and certify it through an independent testing laboratory which will take the sample and retain custody of the material. Have thickness measured and results submitted to the ENGINEER.

E. When cured, the liner shall form a continuous, tight fitting, hard, impermeable liner that is chemically resistant to chemicals found in domestic sewage and which provides the maximum available abrasion resistance.

F. The liner shall be fabricated to a size that when reformed will tightly fit the sewer being rehabilitated. Allowance for longitudinal and circumferential expansion shall be taken into account when sizing and installing the liner. All dimensions shall be field verified by the CONTRACTOR prior to delivery of the liner. The contact tolerance for pipe with a conic section (i.e., oval or round, but not arch pipe) is 2.0 mm; in these cases where any space or gap between the outside surface of the liner and the inside surface of the existing pipe exceeds 2.0 mm, the liner fit will be deemed deficient and corrective action will be required. Where irregularities of the existing pipe exist such as offset joints, protrusions, bumps, and deformations, and the irregularities remain after the sewer has been prepared in accordance with the Contract Documents, exception to the contact tolerance will be allowed in the irregularity zone. The exception shall not present an obstruction to sewage flow.

G. The length of the liner shall be that deemed necessary by the CONTRACTOR to effectively carry out installation and seal the liner at the inlet and outlet of each manhole as specified herein. All lengths shall be verified by the CONTRACTOR prior to construction.

H. The CONTRACTOR shall be responsible for ensuring that the correct liner is installed in each sewer being rehabilitated.

2.2 FLEXIBLE TUBE

A. The tube shall consist of one or more layers of absorbent non-woven felt fabric that meets the requirements of ASTM F1216 or fiberglass laminate tube that meets the requirements of ASTM F2019.

B. The tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that may cause delamination in the CIPPL. No dry or unsaturated layers shall be evident.

C. The felt content of the liner shall be determined by the CONTRACTOR, but shall not exceed 25 percent of the total impregnated liner volume.

D. The wall color of the interior pipe surface of CIPPL after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.

2.3 RESIN

A. Provide a liquid thermosetting resin to saturate the tube and produce a properly cured liner which is resistant to abrasion due to solids, grit, and sand.

B. Use polyester, vinyl ester, or epoxy resin and catalyst system complying with the following requirements and that when properly cured meets the requirements of ASTM F1216 and ASTM F1743. Resins created from recycled materials are not allowed.

1. Polyester Resin: A resin created by reaction products between isophthalic/tetrathalic acid, maleic anhydride, and a glycol characterized by reactive unsaturation located along the molecular chain. This resin is compounded with a reactive styrene monomer and reacted together with initiators/promoters to produce cross-linked copolymer matrices.
2. Vinyl ester Resin: A resin created by reaction products of epoxy resins with methacrylic acid and characterized by reactive unsaturation located in terminal positions of the molecular chain. This resin is compounded with a reactive styrene monomer and reacted together with initiators/promoters to produce cross-linked copolymer matrices.
3. Epoxy Resin: A resin created by reaction products of biphenyl A and epichlorohydrin producing glycidyl ether reactive sites in the terminal position of the molecular chain. This resin is cross-linked with the reactive equivalent of a curing agent suitable for the cured-in-place process.

C. The chemical resistance of the resin system shall be tested by the resin manufacturer in accordance with ASTM D543. The result of exposure to the chemical solutions listed below shall produce loss of not more than 20 percent of the initial physical properties when tested in accordance with ASTM D543 for a period of not less than 1 year at a temperature of 73.4°F. For applications other than municipal wastewater, conduct chemical resistance tests with actual samples of the fluid to be transported in the pipe and in accordance with procedures approved by the ENGINEER.

Chemical Solution	Concentration, %
Tap Water (pH 6-9)	100
Nitric Acid	5
Phosphoric Acid	10
Sulfuric Acid	10
Vegetable Oil	100
Detergent	0.1
Soap	0.1

2.4 HYDROPHILIC SEALS

A. The hydrophilic waterstop end seals shall be bands that are 20 mm wide, 5 mm high, with a double bump on one side, and flat on the other side.

B. Manufacturer: Hydrotite Style RS-0520-3.51 or equal.

2.5 PRE-LINERS

A. Pre-liners shall be 10 mil thick PVC or polyethylene tubes sized to nominal host pipe inside diameter.

PART 3 - EXECUTION

3.1 PREPARATION

A. Review OWNER's television inspection logs and/or conduct additional inspection of the pipes as deemed necessary by CONTRACTOR to plan rehabilitation work. Determine the location of all active service connections prior to lining. Dye test to verify all active service connections, if necessary, or otherwise required by the Contract Documents. Do not reopen taps that are not active.

B. Clean pipes prior to Pre-Construction Inspection, such that the pipes are free of roots, grease, sand, rocks, sludge, tuberculation and other debris. The work of pipe cleaning shall conform to the requirements of Section 33 01 30.41, Cleaning of Sewers.

C. Perform Pre-Construction Inspection in accordance with Section 33 01 30.16, Television Inspection of Sewers. Submit and obtain ENGINEER'S approval of Pre-Construction Inspection prior to wetting out liner. Inspect and confirm the inside diameter, length, alignment and condition of each segment to be lined. Use the data and information collected from this inspection to verify the size of the liner and refine the installation techniques. If unknown physical conditions in the work area are uncovered during the investigation that materially differ from those ordinarily encountered, notify the ENGINEER.

D. As required, provide for continuous flow around the section of pipe that is to be lined in conformance with the requirements of Section 01 51 41, Temporary Pumping. The pump and bypass lines shall be of adequate capacity and size to handle the flow of the sewers. The proposed bypassing system shall be reviewed in advance by the ENGINEER. The review of the bypassing system by the ENGINEER shall in no way relieve the CONTRACTOR of his responsibility and liability.

E. Clear the sewer of obstructions such as solids, broken pipe or intruding services that will prevent the insertion of the liner. If the inspection reveals an obstruction that cannot be removed by the conventional cleaning equipment, remove and/or repair the obstruction by excavation and trench means. Excavation work shall be approved by the ENGINEER prior to commencement of the work and shall be paid under a Change Order.

F. For pipe segments with actively leaking defects that are categorized as Runners or Gushers by the PACP Defect Rating Codes, grout every joint, instructed by the ENGINEER, with running or gushing infiltration to render the pipe free of infiltration. The testing, verification, and warranty inspection requirements contained in Section 33 01 30.61, Packer Injection Grouting, shall not apply to work conducted under this specific paragraph. If a sewer segment has Runners or Gushers through non-groutable defects or if installation of a pre-liner is required for the sewer segment, install a pre-liner if instructed by the ENGINEER.

G. Remove pockets of water from the pipe.

H. In presence of ENGINEER, perform a pre-lining CCTV inspection immediately prior to CIPPL to demonstrate that the pipe is clean and free of roots, grease, tuberculation, sand, rocks, sludge, PACP Runners or Gushers, pockets of water, or structural impediments that would affect long-term viability of the pipe liner. Obtain ENGINEER's verbal approval of the acceptability of the existing pipe condition prior to installation of the CIPPL.

I. Refer to notification requirements under Section 01 35 14, Notification Procedures.

3.2 BYPASS PUMPING

A. Maintain commercial and residential sewer service during the installation process. If necessary to properly complete the work, the CONTRACTOR may interrupt flow from services if such interruption is first coordinated with and allowed by the property owner(s). Contact the property owners 48 hours prior to service flow interruption. Upon completion of the work, immediately reinstate all services and notify the property owner(s) that flow from services is again available. The CONTRACTOR assumes all responsibility for notifying property owners of service interruptions. The CONTRACTOR also assumes all responsibility for blockages, back-ups or damages caused to public or private property as a result of the interruption of service flows, whether caused by the CONTRACTOR'S or property owner's actions.

B. Bypass pumping systems shall be in accordance with Section 01 51 41, Temporary Pumping.

C. Bypass pump sewage from individual laterals, if needed.

3.3 CIPPL INSTALLATION PROCEDURES

A. Maintain two working lateral reinstatement cutters at the job site at all times. Lining work shall not commence if the CONTRACTOR does not have the required number of working cutters on site. No additional time or compensation shall be awarded to the CONTRACTOR in the event that work is stopped due to the CONTRACTOR'S failure to comply with this requirement.

B. Resin Impregnation (Wet Out): Designate a location where the flexible tube will be impregnated with resin. Thoroughly saturate flexible tube prior to installation. For tubes with exposed resin faces, add five percent excess resin to account for resin migration in pipe defects and joints and resin loss through the ends of the liner. Adjust roller gap setting so that the excess resin is uniformly distributed throughout the length of the liner. Wet-out logs shall provide proper documentation that excess resin was added. Tubes that have a coating between the inside surface of the host pipe and the exterior surface of the tube do not require excess resin. A catalyst system, or additive compatible with the resin and flexible tube, may be used as recommended by the manufacturer and with approval of the ENGINEER. Handle the resin-impregnated flexible tube to retard or prevent resin setting until it is ready for insertion.

C. Insertion: Insert flexible tube through an existing access way. The liner material shall be inserted through a manhole by means and method required by the manufacturer and shall be fully extended to the lower manhole. Where practical, insert the tube such that the seam of the liner is positioned at the 6 o'clock position. Use only lubricants approved by the tube manufacturer. Follow the manufacturer's standards during the elevated curing temperature to not over stress the flexible tube and cause damage or failure of the liner prior to cure. Make allowance for circumferential stretching during inversion. Make allowances for longitudinal stretching during pull-in or inversion. Do not utilize overlapped layers of felt in longitudinal seams that cause lumps in the final product. Extend head end (A-side) and tail end (B-side) of the liner for taking samples as required in Paragraph 3.7. If recirculation hoses are used during the curing process, extend the end of such hoses and liner beyond the end of the host pipe and into the downstream manhole.

D. CIPPL restraint sleeves shall be approved for use at the insertion and receiving manholes only. Ensure that the sleeve system does not enter the host pipe. Sleeve restraint systems will not be allowed in intermediate manholes. Cover exposed CIPPL in intermediate manholes with cut PVC pipe and sandbags to prevent overstretching of the liner or insufficient curing.

E. Insert continuous or properly trimmed hydrophilic waterstops at each manhole opening, centered within the intersection of the host pipe and the manhole wall. Trimmed waterstop edges shall be butted up against each other at the crown of the pipe using a 45° miter cut. Waterstops with any gap between the ends will not be accepted. For manholes with outside drops, install two hydrophilic waterstops, one approximately one inch inside the manhole wall and another approximately nine inches upstream of the outside drop and reinstate the drop opening through the CIPPL. If defects in the host pipe near the manhole are such that the end seal will not form a watertight seal between the liner and host pipe, apply hydraulic cement to the defects in the host pipe to provide a smooth surface to receive the end seal.

F. The pressure head used during the installation process shall be sufficient to hold the liner tight to the pipe wall, produce dimples at all service connections and the two access manholes, and prevent wrinkles in the cured liner. The same head shall be great enough to prevent infiltration from entering the pipeline during the curing process. Pressure head shall be maintained sufficiently long enough to allow pockets of water to exfiltrate through the host pipe and prevent lifts in the liner and resin washout.

G. Curing:

1. Follow submitted cure schedule in curing of liner.

2. After insertion is completed, for non-light cured products, apply a suitable recirculation system capable of delivering air, steam, or water at various temperatures, and as required by the liner system manufacturer, uniformly throughout the section to achieve a consistent cure of the resin while allowing any moisture to migrate from the liner. Maximum temperature increase rate between ambient to 140°F shall be 1°F per minute. Maintain the curing temperature or exposure times as recommended by the liner system manufacturer. Prevent excessive temperatures that could scald or bubble the liner. Scalded or blistered liner will be rejected if, in the opinion of the ENGINEER, the performance of the liner is compromised.
3. Fit suitable monitors to any heat source to gauge the temperature of incoming and outgoing water or steam supply or UV lamps, where appropriate.
4. Monitor temperatures through two thermocouples placed between the CIPPL and the invert of the host pipe at each manhole. Record temperature measurement every 5 minutes. Record temperature in Fahrenheit.
5. Continue uninterrupted curing until the desired product is achieved.
6. Provide for vapor tight connections in the downstream manhole such that no vapors enter downstream pipes. Alternatively and at no additional cost to the OWNER, provide styrene odor reducing agents, venting, and downstream plugs sufficient to prevent steam, styrene, or other odors from entering downstream buildings.

H. Cool Down: Initiate a controlled cool-down to cool the hardened liner to a temperature below 110°F, in accordance with the cure schedule. For pipe liners less than 21 mm thick, maximum cool down rate shall be 0.5°F per minute. For pipe liners greater than 21 mm thick, maximum cool down rate shall be 0.3°F per minute. Take care in release of the pressure column so that a vacuum will not develop that could damage the newly installed liner. Do not discharge water in excess of 100°F into the sewer system.

I. Finished Pipe: Provide a finished CIPPL that is continuous and free as commercially practicable from visual defects such as foreign inclusions, dry spots, pinholes, delamination, and wrinkles.

J. Reopen all existing active service connections in each length of sewer immediately following installation of the liner. Reopen active service connections from inside the sewer by means of a remote controlled, CCTV assisted cutting device appropriate for the liner material and the rehabilitated sewer pipe. Each active service connection shall be cut completely open and shall have smooth edges with no protruding material capable of hindering flow or catching and holding solids contained in the flow stream. If the service connection cannot be fully reopened due to time constraints, open each service connection to a minimum of 75% before the end of each working day. Partially opened service connections must be entirely opened by no later than the next working day.

K. Do not reopen capped or inactive lateral connections. Confirm the locations of all capped or inactive lateral connections during pre-construction CCTV inspections.

3.4 TRIMMING AT MANHOLES

A. Delay final trimming and sealing of the liner at manholes according to Manufacturer's guidelines.

B. Neatly and smoothly trim the finished ends of the liner to within two inches of host pipe end. Do not leave any rough edges that may catch debris. Do not leave any portion of CIPPL within the manhole channel.

C. Provide a smooth transition between the existing manhole channel invert and the effluent liner using cementitious or other approved material to prevent settling of sediments or debris from catching on the liner.

3.5 POST-CONSTRUCTION INSPECTION OF COMPLETED WORK

A. Provide Post-Construction Inspection video documentation showing completed work in accordance with Section 33 01 30.16, Television Inspection of Sewers. Perform Post-Construction Inspection immediately following completion of lining work and no later than 60 days after the completion of lining work. In segments with lateral lining work, perform Post-Construction Inspection after all lateral lining work is complete.

3.6 FINAL CLEANUP

A. Upon completion of rehabilitation work and testing, clean and restore project area affected by the Work.

3.7 QUALITY CONTROL TESTS

A. For each installation, collect a restrained pipe sample by placing a section of PVC pipe on the B-Side end (opposite of insertion side) of the liner in the downstream manhole for steam and ultraviolet cures and on the insertion end, A-Side of the liner in the insertion side manhole for water cures. Select PVC material and size to match the inside diameter of the sewer being lined as closely as practical. The length of PVC pipe shall be equal to the length of the two required samples plus 12 inches, minimum. Run the impregnated tube through the pipe and cure the CIPPL under restrained conditions. Cut two cylindrical samples from the center of the restrained pipe sample. Each sample shall be a minimum of 9 inches long or 25 times the CIPPL thickness, whichever is greater. Label samples with the contract number, date of installation, street location, segment number(s), and specified thickness. Hang the second sample from the top rung in the manhole at the downstream end of the liner. Hang sample in a secure manner by nylon rope, sling, or other non-abrasive method. Do not puncture sample. In waterproof, indelible ink, label the sample in the manhole with "Do not remove before (specify date)". The date specified shall be two years after the date of liner installation unless otherwise directed be the ENGINEER. If there is no rung available in the manhole, hang sample in an upstream or downstream manhole and inform ENGINEER of sample storage location. CONTRACTOR may elect to take additional samples at no additional cost to the OWNER.

B. The following tests at the following minimum frequencies will be performed by the CONTRACTOR on CIPPL liners installed. The OWNER may elect to perform additional testing. The CONTRACTOR may, at his discretion and cost, conduct additional testing to improve the resolution of performance test characterization. Any testing CONTRACTOR elects to perform shall be performed by an independent, certified ISO 17025 testing facility. Each test shall be performed by a laboratory with an American Association for Laboratory Accreditation (A2LA) for the specific test to be performed.

1. Short-term Flexural (Bending) Properties – The initial tangent flexural modulus of elasticity and flexural yield strength measured in accordance with ASTM D790.
    a. Frequency – 1 test per inversion shot.
2. Thickness measured in accordance with ASTM D5813/D3567.
    a. Frequency – 1 test per inversion shot.
3. Long-term Flexural Modulus of Elasticity and Long-Term Flexural Strength measured in accordance with ASTM D2990. Test will be performed for a minimum of 10,000 hours, or such longer period as determined by the OWNER, under test conditions and loadings described below. The data points from 1,000 hours to 10,000 hours, or such other time period as determined by the ENGINEER based on the curve or slope of the plotted data, of the Long-term Flexural Modulus and Long-Term Flexural Strength shall be extrapolated using a Microsoft Excel log-log scale linear regression analysis to determine the minimum service life performance of the resin-tube.
    a. Testing will be conducted at:
        i. Temperature: 21 to 25°C.
        ii. Relative humidity: 50% minimum.
        iii. Load: Load used in ASTM D2990 testing.
    b. Frequency – For each different combination of flexible tube, resin, diameter and installation method used on this project: 1 test per every 20 liner shots.
4. Chemical Resistance - The chemical resistivity of the CIPPL measured in accordance with ASTM F1216, Appendix X2 or ASTM D5813.
    a. Frequency – For each different combination of flexible tube, resin, diameter and installation method used on this project: 1 test per every 50 segments lined.

3.8 CIPPL ACCEPTANCE

A. Acceptance of the CIPPL shall be based on the ENGINEER's evaluation of the resin impregnation quality control reports, CIPPL temperature curing logs, Post-Construction Inspection video, laboratory test results for the installed pipe samples, which shall demonstrate:

1. Compliance with the required CIPPL physical properties and thickness.

2. Observed groundwater infiltration of the liner is zero.
3. All active service connections are open and clear.
4. There is no evidence of excessive wrinkles, splits, cracks, breaks, lifts, kinks, scalds, blisters, delaminations, crazing, pinholes or other defects in the liner.
5. Achieving the minimum service life as determined by using the actual thickness and short term flexural modulus of elasticity and flexural strength as measured at each liner installation and modified by the creep retainage measured by the representative sample's ASTM D2990 extrapolation performed in accordance with Paragraph 3.7.

B. If any defective liner is discovered after it has been installed, it shall be removed and replaced with either a sound liner or a new pipe at no additional cost to the OWNER. CONTRACTOR shall be responsible for costs of additional testing required to confirm compliance with these requirements. Obtain approval of the ENGINEER for method of repair, which may require field or workshop demonstration.

C. For liners with defects, if the CONTRACTOR elects to excavate and repair defects in the liner, cut and remove the defective section of liner plus the host pipe to a minimum of two feet beyond each end of the defective liner. Use SDR 26 PVC to replace the removed liner and host pipe. Align invert of point repair with invert of CIPPL. On either side of the proposed repair, carefully remove the host pipe from around the existing sound liner to expose a minimum of five inches of sound liner or as needed for repair coupling. Use stainless steel shielded flexible repair couplings to connect the new PVC directly to the sound liner. Provide repair couplings custom-fabricated specifically to fit the outside diameter of the host pipe and CIPPL to assure a watertight connection. Haunch all exposed liner and new PVC pipe to the springline with pipe bedding material. Cover with concrete all exposed liner and repair couplings a minimum of six inches on either side of the pipe from the springline to six inches above the pipe. Place AASHTO #8, #67, or #57 as approved by the ENGINEER a minimum of eight inches on either side of the pipe from springline of new PVC pipe to eight inches above the pipe.

D. If the CONTRACTOR elects to repair defects in the liner using trenchless methods, remove the defective sections of liner for the full circumference to a minimum of six inches beyond each end of the defective liner or as approved by the ENGINEER. Install a cured-in-place point repair that matches or exceeds the short and long-term material properties of the existing liner and must have the appropriate thickness to withstand the criteria for that particular liner. A minimum of twelve inches of overlap is required on either end of the repair, with hydrophilic bands placed six inches from either end of the repair (i.e., centered on each overlap). Should the proposed cured-in-place point repair and hydrophilic end seals reduce the inside diameter of pipe to an unacceptable diameter, the OWNER retains the right to require alternative materials for the repair or to have the CONTRACTOR perform an excavated repair, at no additional cost to the OWNER.

3.9 WARRANTY INSPECTION

A. Provide a CCTV inspection approximately 18 to 24 months after completion of CIPPL work showing all completed work is in accordance with Section 33 01 30.16, Television Inspection of Sewers. Actual period for inspection shall be determined by the ENGINEER and will ideally be conducted during high groundwater conditions. CONTRACTOR will be provided with 60 days' notice prior to period of inspection. Conduct all inspections in the presence of the ENGINEER.

B. Correct all defects discovered during the warranty period at no additional compensation to the OWNER. After the defects are corrected, inspect the sewer again immediately after repairs are made and again at the warranty inspection time interval indicated above, at no additional compensation to the OWNER.

C. For CIPPL liners that did not meet specification and a negotiated reduction in price was agreed upon by the CONTRACTOR and the OWNER prior to Conditional Acceptance, this out-of-specification condition becomes the basis upon which future corrective actions during the six-month retained percentage period and warranty period is based. The physical record of said condition will be the post-rehabilitation inspection submitted by the CONTRACTOR and accepted by the ENGINEER. Only defects beyond those in place at the time of the negotiated price reduction will be considered the CONTRACTOR's responsibility.

D. If additional defects are discovered during the six-month retained percentage period or warranty period, the OWNER will request the CONTRACTOR to correct these additional defects or request an additional price reduction. If, in correcting these defects, the CONTRACTOR corrects the previous defects (for which the negotiated reduction was incurred), the OWNER shall pay the CONTRACTOR the difference between the originally negotiated reduced value of the liner and the new, improved/corrected value of the liner, the value of which will be solely determined by the ENGINEER. No payment over 100% of the bid price of the liner will be made.

E. The OWNER retains the right to either demand corrective action to address the additional defects or to offer the CONTRACTOR a further negotiated reduction in the value of the liner. The CONTRACTOR retains the right to correct the defective liner at any point during the six-month retained percentage period and warranty period and receive full payment for the liner. The acceptability of all repairs and the finished value of liner after said repairs continue to be solely the ENGINEER's determination.

3.10 LINING SUMMARY

A. A table showing pipe segments to be lined is shown on the Contract Drawings. All depths, lengths, and service locations are approximate and shall be field verified

B. Host pipe diameters listed are considered to be nominal diameter.

+ + END OF SECTION+ +

SECTION 33 01 30.73

CURED-IN-PLACE PIPE LINING – UV CURED

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all materials, equipment, labor and incidentals for the installation and testing of cured-in-place pipe lining (CIPPL) within the sewer main.

B. The sewer main CIPPL process shall consist of inserting a resin-impregnated flexible tube into an existing sewer, expanding the tube out against the sewer pipe, and curing the tube to form a pipe liner. Curing shall be accomplished by circulating heated water or steam to affect the desired cure throughout the tube extending full length from manhole to manhole.

C. The CIPPL shall cure into a hard, impermeable liner pipe of the specified thickness and form a structurally sound liner pipe with a uniformly smooth interior.

1.2 RELATED SECTIONS

A. Section 01 35 14, Notification Procedures

B. Section 01 51 41, Temporary Pumping

C. Section 01 41 28, Confined Space Entry Permit

D. Section 33 01 30.16, Television Inspection of Sewers

E. Section 33 01 30.41, Cleaning of Sewers

F. Section 33 01 30.43, Removal of Protruding Service Connections

G. Section 33 31 71, Sanitary Sewer Service Reconnections

1.3 REFERENCES

A. Standards referenced in this Section are listed below:

1. ASTM D578 – Standard Specification for Glass Fiber Strands.
2. ASTM D790-07 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
3. ASTM D2990-01 - Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.
4. ASTM D3567-97(2006) – Standard Practice for Determining Dimensions of “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings.
5. ASTM D5813-04 – Standard Specification for Cured-In-Place Thermosetting Resin Sewer Pipe.
6. ASTM F1216-09 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.

7. ASTM F1743 –Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP).
8. ASTM F2019-03 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP).
9. DIN EN 761 – Glass Reinforced thermosetting plastics (GRP) pipes.
10. DIN EN 13566-4 – Plastics piping systems for renovation of underground non-pressure drainage and sewerage networks.
11. ISO 178- Determination of Flexural Properties.
12. WRc Sewerage Rehabilitation Manual, Type II Design, 4th Edition, 2001.

1.4 QUALIFICATIONS

A. For each method of installation and curing used on this project, CONTRACTOR shall have a history of at least 100,000 linear feet of CIPPL work in 15" to 24" sewers using a similar resin and flexible tube and using the specific method of installation and curing being used.

B. The CIPPL Work shall be supervised by a foreman having previously supervised a minimum of 10,000 linear feet of CIPPL in 15" to 24" sewer using a similar resin and flexible tube and using the UV cure method of installation and curing proposed.

C. The entity performing the wet-out of the CIPPL shall have been performing this type of work for a minimum of two years and previously wet-out at least 150,000 linear feet of 15" to 24" diameter CIPPL.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Care shall be taken in shipping, handling and storage to avoid damaging the liner. All liners shall be packed in UV blocking protective foil. Any liner damaged in shipment shall be replaced as directed by the OWNER at no additional cost to OWNER.

B. While stored, the CIPPL shall be adequately supported and protected. CIPPL shall be stored in a manner as recommended by the manufacturer and as approved by the ENGINEER.

1.6 QUALITY CONTROL

A. No change of material, design values, or procedures specified herein may be made during the course of the Work without the prior written approval of the ENGINEER.

B. All liner to be installed under this Work may be inspected at the manufacturer plant(s) and wet-out facility for compliance with these Specifications by OWNER or ENGINEER. The CONTRACTOR shall require the wet-out facility's cooperation in these inspections. The cost of inspection will be the responsibility of the OWNER.

C. At the time of manufacture, inspect each lot of liner for defects. At the time of delivery, the liner shall be homogeneous throughout, uniform in color, free of cracks, holes, foreign materials, blisters, or deleterious faults.

D. All test results shall be provided by an independent, certified ISO 17025 testing facility.

1.7 WARRANTY

A. All lining work shall be fully guaranteed by the CONTRACTOR for a period of 5 years from the date of Final Acceptance unless otherwise stipulated in writing by the OWNER prior to the date of Conditional Acceptance. During this period, all defects discovered by the OWNER or ENGINEER shall be addressed by the CONTRACTOR in a satisfactory manner at no cost to the OWNER. In addition to the Warranty Inspection specified under Paragraph 3.9, the OWNER may conduct independent inspections, at its own expense, of the lining Work at any time prior to the completion of the guarantee period.

1.8 SUBMITTALS

A. Submittals shall conform to the requirements of Section 01 33 00, Submittal Procedures.

B. Notices to customers whose sewer service will potentially be interrupted.

1. Notice to be distributed 1 week prior to service interruption.
2. Second notice to be distributed 48 hours prior to service interruption.
3. Third notice immediately prior to disruption of service.
4. Notices shall include at a minimum the date of notice distribution, the date and times of cured-in-place pipe lining construction, a description of construction and limitation to water use, and three contact numbers of the CONTRACTOR for emergencies.

C. Cured-In-Place Pipe:

1. Summary table of CIPP material properties, including short-term flexural modulus of elasticity, 50-year flexural modulus of elasticity, short-term flexural strength (bending stress), 50-year flexural strength (bending stress), chemical resistance, and hardness. Certified test reports shall be submitted verifying each value as described below.
2. Independent third party ISO 17025 certified laboratory test reports demonstrating that the exact resin/liner combination to be used for this project meets the requirements for initial structural properties (performed in accordance with ASTM F1216, ASTM F2019, ASTM F1743, ASTM D790 and/or ISO 178 with a wall thickness measured per DIN EN 13566-4) and chemical resistance (performed in accordance with ASTM F1216-Appendix X2 or ASTM D5813). If the architecture of the CIPP is such that the physical properties vary depending on the direction of testing (i.e., axial versus circumferential), submit test data on both directions in accordance with the test methods listed above in this paragraph.

3. Independent third party ISO 17025 certified laboratory test reports demonstrating that the exact resin and liner to be used for this project has been tested for long-term flexural modulus of elasticity and long-term flexural strength (i.e. 10,000 hour minimum creep testing performed in accordance with ASTM D2990 or DIN EN 761 for design conditions applicable to this project). When filled resins are proposed, complementary data of the same data for unfilled resin shall also be provided. If the architecture of the CIPP is such that the physical properties vary depending on the direction of testing (i.e., axial versus circumferential), submit test data on both directions in accordance with the test methods listed above in this paragraph.

    a. If the data submitted is not for the exact liner to be used on this project, submit a detailed description of the physical properties of both the liner used in the test and the liner to be used for this project to demonstrate that the two liners are comparable in terms of physical properties.

    b. If performance test data for previously installed liners using the proposed resins are available from any source, submit these data as well as the test data for laboratory prepared samples.

    c. Test will be performed for a minimum of 10,000 hours under test conditions and loadings described below. Independent third party test data of the entire ASTM D-2990/DIN EN 761 data set are required as substantiation of the values used in design. The data points from 1,000 hours to 10,000 hours (or longer, if these data are available), or such other time period as determined by the ENGINEER based on the curve or slope of the plotted data, of the Long-term Flexural Modulus shall be extrapolated using a Microsoft Excel log-log scale linear regression analysis to determine the minimum service life performance of the resin-tube.

    d. Testing will be conducted at:

        1. Temperature: 21 to 25°C

        2. Relative humidity: 50% minimum

        3. Load: Load shall be equivalent to a load that is 25% of the yield stress as measured by ASTM D790 or ISO 178, or as approved by ENGINEER.

    e. If non-round host pipes (ovality greater than 10%) are to be rehabilitated and if the architecture of the CIPP is such that the physical properties vary depending on the direction of testing (i.e., axial versus circumferential), only ASTM D2990 or DIN EN 761 test results on a specimen prepared in accordance with ASTM D790 or ISO 178 will be accepted; no other testing methodology for long-term creep will be accepted.

4. The name of the liner and resin manufacturer, the location of the facility where each was manufactured, and a list of appurtenant materials and accessories to be furnished.

5. The type and volume of catalysts and promoters added to the resin.

6. Structural design calculations and specification data sheets listing all parameters used in the liner design and thickness calculations based on Appendix X1 of ASTM F1216 for each pipe segment with less than 10% ovality or based on the WRc Sewerage Rehabilitation Manual, Type II Design, Section 5.3.2.iii for non-round pipe or circular pipes with greater than 10% ovality. All calculations shall be prepared under and stamped by a Professional Engineer registered in the State of Massachusetts.

7. The Quality Control report for the wet-out facility that ensures proper materials and amounts are used in the resin impregnation process and in liner shipping and storage. At a minimum, the Quality Control report should include, for each CIPP segment, resin lot numbers, volumes of resin, catalyst, and enhancers, date of wet-out, and storage and transportation controls and quality assurance procedures. Include a checklist so that each critical step in the resin impregnation process is checked off and initialed.

8. Installation and quality control plan, including bypass pumping plans, mainline sewer cleaning plan and cleanliness requirements, liner shot plan and sequence, liner installation standard procedures (including, but not limited to, minimum and maximum allowable installation pressures and light train sizes and speeds for each anticipated light train setup), intermediate manhole exposed liner restraining method, temperature monitoring plan, odor controls procedures, and plan to manage flow to/from laterals during lining.

9. Curing schedule for each shot, including heating, curing, and cool-down schedules.

D. Field Sample Preparation Plan outlining detailed procedure for preparing samples, including resin preparation, mixing, wetout, insertion, curing, cooling, and post-sample examination to confirm representativeness.

E. Material and method of installation for hydrophilic end seals and pre-liners.

F. Contingency Plan, including methods and equipment to be used to repair unacceptable liner defects and for removing failed liners, and for availability and accessibility of backup equipment such as air compressors and lateral reinstatement cutters.

G. Pre-Construction Inspection Deliverables, Post-construction Inspection Deliverables and Warranty Inspection Deliverables in accordance with Section 33 01 30.16, Television Inspection of Sewers.

H. Curing log, including light source wattage, inner air pressure, exothermic (curing) temperature, and rate of travel of the ultraviolet assembly (curing speed) at least once every five minutes or as recommended by the resin and tube manufacturers, whichever is more frequent.

I. Name and location of ISO 17025 testing laboratory to perform CIPP tests. Provide certification that each test shall be performed by a laboratory with an American Association for Laboratory Accreditation (A2LA) for the specific test to be performed.

J. Performance Quality testing results.

1.9 REQUIREMENTS

A. This Contract requires work in active sewers. Follow all federal, state and local requirements for safety in confined spaces.

B. Conduct worker safety training within one year of start of work that includes reviewing the hazards associated with all equipment, materials, and work practices. Additional safety considerations including safely handling, mixing, and transporting of reagents should be provided by the liner manufacturer, and should include safe operating practices and procedures, appropriate personal protective equipment (PPE) for the various lining operations, and proper storage, transportation, mixing, and disposal of resins, additives, and their associated containers.

PART 2 – PRODUCTS

2.1 DESIGN REQUIREMENTS

A. The CIPPL lining shall be a resin-impregnated flexible tube which is inserted into the sewer to be rehabilitated and cured-in-place by an acceptable UV light curing method. The tube shall not have a polyurethane membrane coating for protection of the interior surface and to provide a uniform, smooth flow surface and may be removed after installation and curing is completed. The resin shall be a liquid thermosetting resin and shall be suitable for the design conditions as well as the curing process.

B. Resin properties based on laboratory prepared samples

1. 50-Year Flexural Strength (ASTM D790, D2990 or DIN EN 761): 2,500 psi minimum.
2. 50-Year Flexural Modulus (ASTM D790, D2990 or DIN EN 761): 200,000 psi minimum, with no less than a 35% reduction from initial (hour 0) strength.
3. Tensile properties per ASTM D638.

C. CIPPL Thickness:

1. The required structural CIPPL wall thickness shall be determined based on the following:
   a. In accordance with ASTM F1216, Appendix X1, Design Considerations for a fully deteriorated host pipe, for a circular host pipe with 10% ovality or less.

b. In accordance with WRc Sewerage Rehabilitation Manual, Type II Design, Section 5.3.2.iii for non-round pipe or circular pipes with greater than 10% ovality.

c. A safety factor of 2.0.

d. A minimum service life of 50 years under continuous service.

e. A modulus of soil reaction of 900 psi.

f. A soil density of 120 lbs/ft3.

g. A Poisson's ratio of 0.3.

h. An enhancement factor of 7.

i. A groundwater elevation over the pipe equivalent to surface grade unless otherwise noted in the Lining Summary at the end of this Section.

j. Ovality for each segment to be lined is noted in the Lining Summary at the end of this Section.

k. Live loads for each segment to be lined are noted in the Lining Summary at the end of this Section.

l. Soil depth for each segment to be lined is noted in the Lining Summary at the end of this Section.

m. In no case shall non-woven, unreinforced liners be thinner than 7.5 mm. In no case shall fiberglass reinforced liners be thinner than 3.5 mm.

n. The long-term flexural modulus and long-term flexural strength used in the design shall be the values as rated for the specified service life and as submitted in Paragraph 1.8, except:

    a. If performance test data for previously installed liners using the proposed resins are available, the long-term flexural modulus and long-term flexural strength values used in the design shall be the 30th percentile of the available data set.

    b. If these test results were generated from laboratory prepared samples, the long-term flexural modulus and long-term flexural strength values used in the design shall be 30% of the value indicated by the laboratory tested samples.

    c. If approved 10,000 hour data are not available, long-term flexural modulus and long-term flexural strength retention used for design thickness shall be 15% (85% reduction) of the short term strengths.

    d. CONTRACTOR may elect to use weaker long-term flexural modulus and long-term flexural strength values than indicated in the submittal for these properties to account for differences in field prepared liners versus laboratory prepared liners, so long as other requirements regarding limits to thickness are not compromised.

2. The liner thickness of each pipe segment shall be determined by the CONTRACTOR and submitted per Paragraph 1.8 of this Section.

2.2 INSTALLED CHARACTERISTICS

A. Installed thickness of the CIPPL shall be as calculated in Paragraph 2.1.D. CIPPL installations that result in thicknesses that exceed the design thickness by the greater of 2mm or 15%, as certified by an independent testing laboratory in accordance with Paragraph 3.7, may be considered non-compliant if, in the judgment of the ENGINEER, will impede O&M and future work. CIPPL with thicknesses less than 95% of design thickness will be assessed for acceptance under Paragraph 3.8.

B. When cured, the liner shall form a continuous, tight fitting, hard, impermeable liner that is chemically resistant to chemicals found in domestic sewage and which provides the maximum available abrasion resistance.

C. The liner shall be fabricated to a size that when cured will tightly fit the sewer being rehabilitated. Allowance for longitudinal and circumferential expansion shall be taken into account when sizing and installing the liner. Field verify all dimensions prior to delivery of the liner. The contact tolerance for pipe with a conic section (i.e., oval or round, but not arch pipe) is 2.0 mm; in these cases where any space or gap between the outside surface of the liner and the inside surface of the existing pipe exceeds 2.0 mm, the liner fit will be deemed deficient and corrective action will be required. Where irregularities of the existing pipe exist such as offset joints, protrusions, bumps, and deformations, and the irregularities remain after the sewer has been prepared in accordance with the Contract Documents, exception to the contact tolerance will be allowed in the irregularity zone. The exception shall not present an obstruction to sewage flow.

D. The length of the liner shall be that deemed necessary by the CONTRACTOR to effectively carry out installation and seal the liner at the inlet and outlet of each manhole/structure as specified herein. Field verify all lengths prior to construction.

2.3 FLEXIBLE TUBE

A. The tube should consist of one or more layers of flexible needled felt or an equivalent nonwoven or woven material, or a combination of nonwoven and woven materials, capable of carrying resin and withstanding installation pressures and curing temperatures. The tube should be compatible with the resin system used. The material should be able to stretch to fit irregular pipe sections and negotiate bends. If the tube contains fiberglass, the fiberglass shall be corrosion resistant E-CR glass conforming to ASTM D578.

B. The tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that may cause delamination in the CIPPL. No dry or unsaturated layers shall be evident.

C. The wall color of the interior pipe surface of CIPPL after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.

2.4 RESIN

A. The liquid thermosetting resin shall saturate the tube and produce a properly cured liner which is resistant to abrasion due to solids, grit, and sand.

B. Polyester, vinyl ester, or epoxy resin and catalyst systems are acceptable. The resin must be able to cure in the presence of water and the initiation temperature for cure should be less than 180°F (82.2°C). Resins created from recycled materials are not allowed.

C. Resin enhancers are allowed and may be used by the CONTRACTOR. The maximum amount of enhancer allowed is 30 pounds enhancer per 100 pounds resin. Submit data verifying amount of enhancer and certify the limit of enhancer has not been exceeded.

D. Resin enhancers shall utilize a suitable bond enhancing compound to increase the bond between resins and other materials. Submit certification that bond enhancing compound is suitable for use in aqueous environments.

2.4 HYDROPHILIC SEALS

A. Provide hydrophilic end seals at each end of the CIPPL to prevent water from migrating between the liner and host pipe into the manhole. Provide one of the following:

1. Seamlessly molded neoprene end seal.

a. Product and Manufacturer: Insignia End Seal Sleeve as manufactured by LMK Technologies or equal.

2.5 PRE-LINERS

A. Provide pre-liners where shown or specified. Pre-liners shall be 10 mil thick PVC or polyethylene tubes sized to nominal host pipe inside diameter. Pre-liners will not be required for pull-in liners with waterproof exterior film.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean pipes prior to Pre-Construction Inspection, such that the pipes are free of roots, grease, sand, rocks, sludge, tuberculation (to a tolerance of 0.25 inches projection) and other debris. The work of pipe cleaning shall conform to the requirements of Section 33 01 30.41, Cleaning of Sewers.

B. Inform ENGINEER in writing if any laterals shown on the Drawings as capped or inactive show evidence of being active.

C. For any tap encountered that is not shown on the Drawings, notify ENGINEER prior to lining the segment of main. ENGINEER may direct CONTRACTOR to perform dye testing of adjacent properties in order to determine if tap is active. If CONTRACTOR is directed to perform dye testing, notify ENGINEER of dye testing results prior to lining segment of main. Reinstate tap unless the tap is determined by the CONTRACTOR to be inactive.

D. Remove intruding taps and seal material prior to Pre-Construction Inspection.

E. Perform Pre-Construction Inspection in accordance with Section 33 01 30.16, Television Inspection of Sewers, except limit time recording flows from active taps to 10 seconds. Submit and obtain ENGINEER'S acceptance of Pre-Construction Inspection prior to wetting out liner. Inspect and confirm the inside diameter, alignment and condition of each segment to be lined. Use the data and information collected from this inspection to verify the size of the liner and refine the installation techniques. Measure and document the stationing of all active and inactive service connections prior to lining. If unknown physical conditions in the work area are uncovered during the investigation that materially differ from those ordinarily encountered, notify the ENGINEER.

F. As required, provide for continuous flow around the section of pipe that is to be lined in conformance with the requirements of Section 01 51 41, Temporary Pumping. The pump and bypass lines shall be of adequate capacity and size to handle the flow of the sewers. The proposed bypassing system shall be reviewed in advance by the ENGINEER. The review of the bypassing system by the ENGINEER shall in no way relieve the CONTRACTOR of his responsibility and liability.

G. Clear the line of obstructions such as solids or broken pipe that will prevent the insertion of the liner. If inspection reveals an obstruction that cannot be removed by the conventional cleaning equipment, make an excavation and repair the obstruction. Excavation work shall be approved by the ENGINEER prior to commencement of the work and shall be paid under a Change Order.

H. For pipe segments found to have any actively leaking defects that would be categorized as Runners or Gushers by the PACP Defect Rating Codes, grout every joint on said pipe segment if instructed by the ENGINEER. When so instructed, render the pipe free of Runners or Gushers. The testing, verification, and warranty inspection requirements that may be contained in Section 33 01 30.61 shall not apply to work conducted under this specific paragraph. Payment for grouting joints in pipes to be lined, when directed by the ENGINEER, shall be included in the cost for cured-in-place pipe installation. If a line segment has Runners or Gushers through non-groutable defects or if installation of a pre-liner is shown or specified for the line segment, install a pre-liner if instructed by the ENGINEER. If the cured-in-place liner has an integral exterior tube that seals the liner from the leaking water, a pre-liner will not be required.

I. Remove pockets of water from the pipe.

J. In presence of ENGINEER, perform a pre-lining CCTV inspection immediately prior to CIPPL lining to demonstrate that the pipe is clean and free of roots, grease, sand, rocks, sludge, PACP Runners or Gushers, pockets of water, or structural impediments that would affect long-term viability of the pipe liner. Obtain ENGINEER's verbal approval of the acceptability of the existing pipe condition prior to installation of the CIPPL.

K. Any lifts caused by water or bedding entering the pipe through defects during the insertion process shall be the responsibility of the CONTRACTOR to repair. CONTRACTOR is cautioned to understand the groundwater, soil, and host pipe conditions and plan his techniques accordingly.

L. See notification requirements under Section 01 35 14, Notification Procedures.

3.2 BYPASS PUMPING

A. Maintain commercial and residential sewer service during the installation process. If necessary to properly complete the work, the CONTRACTOR may interrupt flow from services if such interruption is first coordinated with and allowed by the property owner(s). Contact the property owners in accordance with Section 01 35 14, Notification Procedures. Upon completion of the work, immediately reinstate all services and notify the property owner(s) that service is again available. The CONTRACTOR assumes all responsibility for notifying property owners of service interruptions. The CONTRACTOR also assumes all responsibility for blockages, back-ups, and damages caused to public and private property as a result of the interruption of service, whether caused by the CONTRACTOR'S or property owner's actions.

B. Bypass pumping systems shall be in accordance with Section 01 51 41, Temporary Pumping.

C. Bypass pump sewage from individual laterals, if needed.

3.3 CIPPL INSTALLATION PROCEDURES

A. The insertion, inflation, and curing method shall be determined by CONTRACTOR.

B. Maintain two working lateral reinstatement cutters at the job site at all times. Lining work shall not commence if the CONTRACTOR does not have the required number of working cutters on site. No additional time or compensation shall be awarded to the CONTRACTOR in the event that work is stopped due to the CONTRACTOR'S failure to comply with this requirement.

C. Resin Impregnation (Wet Out): Designate a location where the flexible tube will be impregnated with resin. Thoroughly saturate flexible tube prior to installation. For tubes with exposed resin faces, add five percent excess resin to account for resin migration in pipe defects and joints and resin loss through the ends of the liner. Adjust roller gap setting so that the excess resin is uniformly distributed throughout the length of the liner. Wet-out logs shall provide documentation that proper amount of resin was added. Tubes that have a coating between the inside

surface of the host pipe and the exterior surface of the tube do not require excess resin. A catalyst system, or additive compatible with the resin and flexible tube, may be used as recommended by the manufacturer and with approval of the ENGINEER. Handle the resin-impregnated flexible tube to retard or prevent resin setting until it is ready for insertion.

D. Insertion of Inverted Liners: Insert flexible tube through an existing access way. The liner material shall be inserted through a manhole by means and method required by the manufacturer, and shall be fully extended to the lower manhole. Where practical, insert the tube such that the seam of the liner is positioned at the 6 o'clock position. Use only lubricants approved by the tube manufacturer. Follow the manufacturer's standards during the elevated curing temperature so as not to over stress the flexible tube and cause damage or failure of the liner prior to cure. Make allowance for circumferential stretching during inversion. Make allowances for longitudinal stretching during pull-in or inversion. Do not utilize overlapped layers of felt in longitudinal seams that cause lumps in the final product. Extend head end (A-side) and tail end (B-side) of the liner for taking samples as required in Paragraph 3.7. If recirculation hoses are used during the curing process, extend the end of such hoses and liner beyond the end of the host pipe and into the downstream manhole.

E. Insertion of Pull-in Liners: Insert, anchor, and install a slip-sheet on the bottom half of the pipe prior to liner insertion for the purpose of smoothing out and bridging any missing areas of the bottom of the existing host pipe, and ease of pulling, and protection of the outer film of liner during the pull-in process. Insert flexible tube through an existing access way. The liner material shall be inserted through a manhole by a winch capable of holding a constant tension and documenting the amount of tension used; the manufacturer's maximum pull in tension shall not be exceeded and liner shall be fully extended to the lower manhole. Use only lubricants approved by the tube manufacturer. Follow the manufacturer's standards during the elevated curing temperature so as not to over stress the flexible tube and cause damage or failure of the liner prior to cure. Make allowance for circumferential stretching during inversion. Make allowances for longitudinal stretching during pull-in or inversion.

F. Any lifts caused by water or bedding entering the pipe through defects during the insertion process shall be the responsibility of the CONTRACTOR to repair. CONTRACTOR is cautioned to understand the groundwater, soil, and host pipe conditions and plan his techniques accordingly.

G. CIPPL restraint sleeves shall be approved for use at the insertion and receiving manholes only. Ensure that the sleeve system does not enter the host pipe. Sleeve restraint systems will not be allowed in intermediate manholes. Cover exposed CIPPL in intermediate manholes with cut PVC pipe and sandbags to prevent overstretching of the liner or insufficient curing.

H. Insert continuous or properly trimmed hydrophilic waterstops at each manhole opening, centered within the intersection of the host pipe and the manhole wall. Trimmed waterstop edges (for Hydrotite waterstops) shall be butted up against each other at the crown of the pipe using a 45° miter cut. Waterstops with any gap between the ends will not be accepted. For manholes with outside drops, install two hydrophilic waterstops, one approximately one inch inside the manhole wall and another approximately nine inches upstream of the outside drop and reinstate the drop opening through the CIPPL. If defects in the host pipe near the manhole are such that the end seal will not form a watertight seal between the liner and host pipe, apply hydraulic cement to the defects in the host pipe to provide a smooth surface to receive the end seal.

I. The pressure head used during the installation process shall be sufficient to hold the liner tight to the pipe wall, produce dimples at all service connections and the two access manholes, and prevent wrinkles in the cured liner. The same pressure shall be great enough to prevent infiltration from entering the pipeline during the curing process. The pressure shall be maintained sufficiently long enough to allow pockets of water to exfiltrate through the host pipe and prevent lifts in the liner and resin washout.

J. Curing:

1. Follow submitted cure schedule in curing of liner.
2. After insertion is completed, cap each end of fiberglass liner. Assemble and insert UV light source according to submitted cure schedule, or as adjusted via approved changes to curing equipment. Maintain the curing speed and light source wattage in accordance with approved cure schedule, or as adjusted via approved changes to curing equipment. Prevent excessive temperatures that could scald or bubble the liner. Scalded or blistered liner will be rejected if, in the opinion of the ENGINEER, the performance of the liner is compromised.
3. Monitor temperatures through thermal infrared sensors located on UV light train. Record curing data at intervals no greater than 30 seconds. Record temperature in Fahrenheit.
4. Continue uninterrupted curing until the desired product is achieved.
5. Provide for vapor tight connections in the downstream manhole such that no vapors enter downstream pipes. Alternatively and at no additional cost to the OWNER, provide styrene odor reducing agents, venting, and downstream plugs sufficient to prevent steam, styrene, or other odors from entering downstream buildings.

H. Cool Down: Maintain pressure on liner until it is cured/rigid enough to support full design load, in accordance with the approved cure procedures. Detach packer at end opposite of blower, and run blower at half speed for minimum of 40 minutes. Visually inspect pipe and record temperature of liner.

I. Finished Pipe: Provide a finished CIPPL that is continuous and free as commercially practicable from visual defects such as foreign inclusions, dry spots, pinholes, delamination, and wrinkles at any location totaling more than 5% of host pipe inside diameter.

J. Reopen all of the existing active service connections in each length of sewer immediately following installation of the liner. Reopen active service connections from inside the sewer by means of a remote controlled, CCTV assisted cutting device appropriate for the liner material and the rehabilitated sewer pipe. Each active service connection shall be cut completely open and shall have smooth edges with no protruding material capable of hindering flow or catching and holding solids contained in the flow stream. If the service connection cannot be fully reopened due to time constraints, open each service connection to a minimum of 75% before the end of each working day. Partially opened service connections must be entirely opened by no later than the next working day. Capture and remove any solids produced from lateral reinstatement with any single dimension longer than 3 inches.

K. Do not reopen capped or inactive lateral connections. Confirm the locations of all capped or inactive laterals during pre-construction CCTV inspections.

3.4 TRIMMING AT MANHOLES

A. Delay final trimming and sealing of the liner at manholes according to Manufacturer's guidelines. Capture and remove any solids produced with any single dimension longer than 3 inches.

B. Neatly and smoothly trim the finished ends of the liner to within two inches of host pipe end. Do not leave any rough edges that may catch debris. Do not leave any portion of CIPPL within the manhole channel.

C. Provide a smooth transition between the existing manhole channel invert and the effluent liner using cementitious or other approved material to prevent settling of sediments or debris from catching on the liner.

3.5 POST-CONSTRUCTION INSPECTION OF COMPLETED WORK

A. Conduct Post-Lining Inspection showing the completed work immediately after lining and before tap rough cut in accordance with Section 33 01 30.16, Television Inspection of Sewers.

B. Conduct Post-Construction Inspection showing completed work in accordance with Section 33 01 30.16, Television Inspection of Sewers. Perform Post-Construction Inspection no sooner than 90 days and no later than 180 days after the completion of lining work. In segments with lateral lining work, Post-Construction Inspection will be conducted after all lateral lining work is complete.

C. Correct all defects discovered during the television inspection before Conditional Acceptance. After the defects are corrected, repeat the Post-Construction Inspection for that sewer line.

3.6 FINAL CLEANUP

A. Upon completion of rehabilitation work and testing, clean and restore project area affected by the Work.

3.7 QUALITY CONTROL TESTS

A. Collect sufficient samples to perform the analyses specified below at frequencies specified in paragraph B. The sampling requirements specified assume the test methods listed in paragraph B will be used. If reinforced liners are utilized whose architecture is such that the physical properties vary depending on the direction of testing (i.e., axial versus circumferential), the sampling requirements will be modified accordingly at no additional cost to OWNER if alternate laboratory testing methods are required.

1. For CIPPL less than 21-inches diameter or equivalent, for thickness and flexural strength tests, cut a sufficient length of liner from the same portion of liner to be installed in the ground to provide the two required samples plus a minimum of 12 inches. Select a sufficiently long section of pipe sized to match the inside diameter of the pipe being lined as closely as practical to cure the sample liner above ground. Above ground, run the impregnated tube through the pipe and insert one section of the light train assembly and cure the liner under restrained conditions in a manner that represents the conditions experienced during installation of the in-ground and in accordance with approved sample curing procedures liners and in accordance with the Field Sample Preparation Plan submitted in Paragraph 1.8.

2. Cut two cylindrical samples from the center of the restrained pipe sample. Each sample shall be a minimum of 12 inches long or 25 times the CIPPL thickness, whichever is greater. Label samples with the contract number, date of installation, street location, segment number(s), and specified thickness. Send one sample to an independent third-party laboratory. Hang the second sample from the top rung in the manhole at the downstream end of the liner. Hang sample in a secure manner by nylon rope, sling, or other non-abrasive method. Do not puncture sample. In waterproof, indelible ink, label the sample in the manhole with “Do not remove before (specify date)”. The date specified shall be two years after the date of liner installation unless otherwise directed be the ENGINEER. If there is no rung available in the manhole, hang sample in an upstream or downstream manhole and inform ENGINEER of sample storage location. CONTRACTOR may elect to take additional samples at no additional cost to the OWNER.

3. For CIPPL equal to or greater than 21-inches diameter or equivalent, either prepare samples as described in the preceding paragraph or prepare two plate samples from the same tube and resin as the CIPPL at the time of wet-out. Document plate sample preparation on wet-out logs. Each plate sample shall be sized appropriately for third-party testing of all required quality control test. Cure the plate samples at the same time and under the same conditions as the CIPPL in a manner that represents the conditions experienced during

installation of the in-ground liners and in accordance with the Field Sample Preparation Plan submitted in Paragraph 1.8.C.

4. Label samples with the contract number, date of installation, street location, segment number(s), and specified thickness. Send one sample to an independent third-part laboratory. Hang the second sample from the top rung in the manhole at the downstream end of the liner. Hang sample in a secure manner by nylon rope, sling, or other non-abrasive method. Do not puncture sample. If there is no rung available in the manhole, hang sample in an upstream or downstream manhole and inform ENGINEER of sample storage location.

    a. Where plate samples cannot be practically cured as part of the installation, coordinate with the ENGINEER and make every attempt to take a restrained sample at downtubes or other locations.

B. The following tests at the following minimum frequencies will be performed by the CONTRACTOR on CIPPL liners installed. The OWNER may elect to perform additional testing. The CONTRACTOR may, at his discretion and cost, conduct additional testing to improve the resolution of performance test characterization. Any testing CONTRACTOR elects to perform shall be performed by an independent, certified ISO 17025 testing facility. Each test shall be performed by a laboratory with an American Association for Laboratory Accreditation (A2LA) for the specific test to be performed.

1. Short-term Flexural (Bending) Properties – The initial tangent flexural modulus of elasticity and flexural yield strength measured in accordance with ASTM D790.

    a. Frequency – 1 test per liner shot.

2. Thickness measured in accordance with ASTM D3567.

    a) Frequency – 1 test per liner shot.

3. Long-term Flexural Modulus of Elasticity measured in accordance with ASTM D2990. Test will be performed for a minimum of 10,000 hours, or such longer period as determined by the OWNER, under test conditions and loadings described below. The data points from 1,000 hours to 10,000 hours, or such other time period as determined by the ENGINEER based on the curve or slope of the plotted data, of the Long-term Flexural Modulus shall be extrapolated using a Microsoft Excel log-log scale linear regression analysis to determine the minimum service life performance of the resin-tube.

    a) Testing will be conducted at:

        i. Temperature: 21 to 25°C.

        ii. Relative humidity: 50% minimum.

        iii. Load: Load used in ASTM D2990 or DIN EN 761 testing as submitted in accordance with Paragraph 1.8.A.3.

b) Frequency – For each tube/resin/installation method used on this project: 1 test per every 20 liner shots or fraction thereof, with the first test conducted on the sample from the first shot of the Work. Take samples at uniform intervals during the work. If more than one sample of tube/resin/installation methods is collected and tested over the course of the Work, the average of the sample results will be considered representative of all the liners installed for that particular resin-fabric combination. For example, 4 samples of a particular tube/resin/installation method combination are analyzed for retention of long term flexural modulus; the percent retention of initial strength results are 20%, 45%, 55%, and 60%. The average percent retention is 45% for liners constructed from this tube/resin/installation method combination.

4. Chemical Resistance - The chemical resistivity of the CIPPL measured in accordance with ASTM F1216, Appendix X2.

a) Frequency – For each tube/resin/installation method used on this project: 1 test per every 50 liner shots or fraction thereof, with the first test conducted on the sample from the first shot of the Work. Take samples at uniform intervals during the work. If more than one sample of tube/resin/installation methods is collected and tested over the course of the Work, the average of the sample results will be considered representative of all the liners installed for that particular resin-fabric combination. For example, 4 samples of a particular tube/resin/installation method combination are analyzed for chemical resistance to gasoline; the percent retention of initial strength results is 60%, 70%, 80%, and 90%. The average percent retention is 75% for liners constructed from this tube/resin/installation method combination.

3.8 CIPPL ACCEPTANCE

A. Acceptance of the CIPPL shall be based on the ENGINEER's evaluation of the resin impregnation quality control reports, CIPPL curing logs, Post-construction Inspection video, laboratory test results for the installed pipe samples, which shall demonstrate:

1. Compliance with the required CIPPL physical properties and thickness.
2. Observed groundwater infiltration of the liner is zero.
3. All active service connections are open and clear.
4. There is no evidence of excessive wrinkles, splits, cracks, breaks, lifts, kinks, scalds, blisters, delaminations, crazing or other defects in the liner.
5. Achieving the minimum service life as determined by using the actual thickness and short term flexural modulus of elasticity as measured at each liner installation and modified by the creep retainage measured by the representative sample's ASTM D2990 extrapolation performed in accordance with Paragraph 3.7.

B. If any defective liner is discovered after it has been installed, it shall be removed and replaced with either a sound liner or a new pipe at no additional cost to the OWNER. CONTRACTOR shall be responsible for costs of additional testing required to confirm compliance with these requirements. Obtain approval of the ENGINEER for method of repair, which may require field or workshop demonstration.

C. For liners with defects, if the CONTRACTOR elects to excavate and repair defects in the liner, cut and remove the defective section of liner plus the host pipe to a minimum of two feet beyond each end of the defective liner. Use SDR 35 PVC to replace the removed liner and host pipe. Align invert of point repair with invert of CIPPL. On either side of the proposed repair, carefully remove the host pipe from around the existing sound liner to expose a minimum of five inches of sound liner or as needed for repair coupling. Use stainless steel shielded flexible repair couplings to connect the new PVC directly to the sound liner. Provide repair couplings custom-fabricated specifically to fit the outside diameter of the host pipe and CIPPL to assure a watertight connection. Haunch all exposed liner and new PVC pipe to the springline with pipe bedding material. Cover with concrete all exposed liner and repair couplings a minimum of six inches on either side of the pipe from the springline to six inches above the pipe. Place AASHTO #67 as approved by the ENGINEER a minimum of eight inches on either side of the pipe from springline of new PVC pipe to eight inches above the pipe. Complete repair, pipe installation, bedding, and backfill.

D. If the CONTRACTOR elects to repair defects in the liner using trenchless methods, remove the defective sections of liner for the full circumference to a minimum of six inches beyond each end of the defective liner or as approved by the ENGINEER. Install a cured-in-place point repair that matches or exceeds the short and long-term material properties of the existing liner and must have the appropriate thickness to withstand the criteria for that particular liner as listed in the Lining Summary Table at the end of this Section. A minimum of twelve inches of overlap is required on either end of the repair, with hydrophilic bands placed six inches from either end of the repair (i.e., centered on each overlap). Should the proposed cured-in-place point repair and hydrophilic end seals reduce the inside diameter of pipe to an unacceptable diameter, the OWNER retains the right to require alternative materials for the repair or to have the CONTRACTOR perform an excavated repair, at no additional cost to the OWNER.

E. At the OWNER's option, the OWNER may have the ENGINEER conduct an evaluation of the diminished value of any defective liner as described below and recommend a reduced payment for the liner. At his option, CONTRACTOR may accept the recommended reduced payment or address all defective conditions as provided in Paragraph 3.8.B until an acceptable condition is achieved. Acceptance of reduced payment may necessitate the CONTRACTOR making a refund payment to the OWNER.

    1. For liners that have observed groundwater infiltration, poorly opened lateral taps, or excessive wrinkles, splits, cracks, breaks, lifts, kinks, scalds, blisters, delamination, crazing, or other defects in the liner, ENGINEER will make an estimation of reduced value.

3.9 WARRANTY INSPECTION

A. Provide a CCTV inspection 18 to 24 months after completion of CIPPL work showing all completed work in accordance with Section 33 01 30.16, Television Inspection of Sewers. Actual period for inspection shall be determined by the ENGINEER and will ideally be conducted during high groundwater conditions. CONTRACTOR will be provided with 60 days notice prior to period of inspection.

B. Correct all defects discovered during the warranty period at no additional compensation. After the defects are corrected, inspect the sewer again at no additional compensation.

C. For CIPPL liners that did not meet specification and a negotiated reduction in price was agreed upon by the CONTRACTOR and the OWNER prior to Conditional Acceptance, this out-of-specification condition becomes the basis upon which future corrective actions during the six-month retained percentage period and warranty period is based. The physical record of said condition will be the post-rehabilitation inspection submitted by the CONTRACTOR and accepted by the ENGINEER. Only defects beyond those in place at the time of the negotiated price reduction will be considered the CONTRACTOR's responsibility.

D. If additional defects are discovered during the six-month retained percentage period or warranty period, the OWNER will request the CONTRACTOR to correct these additional defects or request an additional price reduction. If, in correcting these defects, the CONTRACTOR corrects the previous defects (for which the negotiated reduction was incurred), the OWNER shall pay the CONTRACTOR the difference between the originally negotiated reduced value of the liner and the new, improved/corrected value of the liner, the value of which will be solely determined by the ENGINEER. No payment over 100% of the bid price of the liner will be made.

E. The OWNER retains the right to either demand corrective action to address the additional defects or to offer the CONTRACTOR a further negotiated reduction in the value of the liner. The CONTRACTOR retains the right to correct the defective liner at any point during the six-month retained percentage period and warranty period and receive full payment for the liner. The acceptability of all repairs and the finished value of liner after said repairs continue to be solely the ENGINEER's determination.

+ + END OF SECTION+ +

SECTION 33 01 30.74

CURED-IN-PLACE LATERAL LINING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all materials, equipment, labor, and incidentals for the installation and testing of full-wrap, one-piece cured-in-place lateral connection liners (CIPLL). from the mainline sewer

B. Service laterals are 6-inch through 8 inch nominal diameter. Mainline pipe diameters are 15-inch, 21-inch, and 24-inch nominal diameter.

C. Lateral connection lining shall only occur from the mainline pipe. Sewer cleanouts shall not be utilized for lateral cleaning, television inspections, or lining. If lateral preparation or access is not possible from the mainline pipe, then CONTRACTOR shall notify OWNER and ENGINEER. Laterals may or may not have existing cleanouts. Existing cleanout shall not be utilized unless CONTRACTOR obtains prior written approval from OWNER, ENGINEER, and property owner.

D. The lateral lining process shall be accomplished using a flexible tube sized for the various diameters and fittings encountered, and a thermo-set or ambient cure resin with physical and chemical properties appropriate for the application. The CIPLL shall extend from the sewer main connection up the lateral to the location indicated in this Section or as directed by ENGINEER.

E. Sewer lateral connections may be a combination of tees, wyes or break-in taps of varying sizes and angles of connection.

F. The CIPLL shall cure into a hard, impermeable liner pipe of the specified thickness and form a structurally sound liner pipe with a uniformly smooth interior providing hydraulic flow equal to or greater than the existing lateral in original condition.

G. The CIPLL shall extend from the sewer main connection up the lateral to the distance specified and along a length of the mainline, either directly on the host pipe or on a mainline liner, if present. The CIPLL will provide a non-leaking connection at the interface of the mainline and lateral pipes.

H. If during the pre-lateral lining television inspection performed after mainline pipe lining, lateral connections are found to be visibly leaking or have visible voids between the lateral connection pipe and the main line sewer, those connections shall be repaired internally using an appropriate method approved by the OWNER.

1.2 REQUIREMENTS

A. This Contract requires work in active sewers. Follow all federal, state, and local requirements for safety in confined spaces.

B. Conduct worker safety training within one year of start of work that includes reviewing the hazards associated with all equipment, materials, and work practices. Additional safety considerations including safely handling, mixing, and transporting of reagents should be provided by the liner manufacturer, and should include safe operating practices and procedures, appropriate personal protective equipment (PPE) for the various lining operations, and proper storage, transportation, mixing, and disposal of resins, additives, and their associated containers.

1.3 RELATED SECTIONS

A. Section 01 35 14, Notification Procedures.

C. Section 01 51 41, Temporary Pumping

D. Section 33 01 30.16, Television Inspection of Sewers

E. Section 33 01 30.41, Cleaning of Sewers

F. Section 33 01 30.65, Pressure Testing of Sewer Pipe Joints and Tap Connections

G. Section 33 31 71, Sanitary Sewer Service Re-connections

1.4 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. ASTM C581-03 - Standard Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass-Fiber-Reinforced Structures Intended for Liquid Service.
   2. ASTM D543-06 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
   3. ASTM D638-03 – Standard Test Method for Tensile Properties of Plastics.
   4. ASTM D790-07 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
   5. ASTM D2583-07 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
   6. ASTM D2990-01 - Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.
   7. ASTM D3567-97(2006) – Standard Practice for Determining Dimensions of “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings.
   8. ASTM D5813-04 – Standard Specification for Cured-In-Place Thermosetting Resin Sewer Pipe.

9. ASTM F1216-07B – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
10. ASTM F2019-03 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPPL).
11. ISO 178- Determination of Flexural Properties.
12. DIN EN 761 – Glass Reinforced thermosetting plastics (GRP) pipes.
13. DIN EN 13566-4 – Plastics piping systems for renovation of underground non-pressure drainage and sewerage networks.
14. WRc Sewerage Rehabilitation Manual, Type II Design, 4th Edition, 2001.

1.5 QUALIFICATIONS

A. CONTRACTOR shall be certified by the manufacturer for the installation of lateral lining systems. The license or certification shall include the names of the persons who have been trained or certified by the manufacturer.

B. The CONTRACTOR shall use a Manufactured System that has a minimum of a five-year history of satisfactory performance.

C. CONTRACTOR shall have successfully completed at least 20 CIPLL installations for the manufacturer proposed using the specific method of installation and curing proposed.

D. Each installation crew must be directly supervised by a dedicated foreman having previously supervised the successful installation of at least 10 CIPLL rehabilitations from mainline using the manufacturer proposed and using the specific method of installation and curing proposed.

E. Exclusive of the foreman, the installation crew must include at least 2 members who have each previously completed the successful installation of at least 10 CIPLL rehabilitations from the mainline using the manufacturer proposed and using the specific method of installation and curing proposed.

F. Bidders shall be prepared to submit a list of installation projects and number of lateral connections sealed providing contact names, addresses, and telephone numbers for reference.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Care shall be taken in shipping, handling and storage to avoid damaging the liner. Extra care shall be taken during hot and cold weather construction. Replace any liner damaged in shipment as directed by the OWNER.

B. Adequately support and protect the CIPLL while stored. Store CIPLL in a manner as recommended by the manufacturer and as approved by the ENGINEER.

1.7 QUALITY CONTROL

A. No change of material, design values, or procedures specified herein may be made during the course of the Work without the prior written approval of the ENGINEER.

1.8 WARRANTIES

A. Installation Warranty:
   1. The CONTRACTOR shall require the CIPLL Installer to warrant, and the CONTRACTOR shall also separately warrant, to the OWNER that for a period of five (5) years from the date of Final Acceptance unless otherwise stipulated in writing by the OWNER prior to the date of substantial completion, the CIPLL installations conform to all specification requirements and are free from defects in materials and workmanship. The CIPLL Installer and the CONTRACTOR shall repair or replace, at the sole option of the OWNER, any work found to be defective within the warranty period. Such repair or replacement shall include the cost of removal and reinstallation at no cost to the OWNER.

B. Manufacturer's Warranty:
   1. The CONTRACTOR shall warrant, and shall obtain from the manufacturer, written warranty that the CIPLL will be free from defects in design, materials, and workmanship for a period of five (5) years following the date of substantial completion. Said warranty, containing no exclusions or limitations, shall be in a form acceptable to, and for the benefit of, the Owner and shall be submitted by the CONTRACTOR as a condition of final payment.

C. In addition to the Warranty Inspection specified under Paragraph 3.9, the OWNER may conduct independent inspections, at its own expense, of the CIPLL Work at any time prior to the completion of the guarantee period.

1.9 SUBMITTALS

A. Documentation of required qualifications of personnel.

B. Documentation of meeting experience requirements in Section 1.4. Include references with names and contact information.

C. Notices to customers whose sewer service will potentially be interrupted.
   1. Notice to be distributed 1 week prior to service interruption.
   2. Second notice to be distributed 24 to 48 hours prior to service interruption.
   3. Third notice immediately prior to disruption of service.
   4. Fourth notice shall be immediately after return of normal service.

5. Notices shall include at a minimum the date of notice distribution; the date and times of cured-in-place pipe lining construction; a description of construction and limitation to water use; CONTRACTOR'S name, telephone number, and the project coordinator to contact for additional information and inquiries; and three contact numbers of the CONTRACTOR for emergencies.
6. Any other notifications to property owners whose properties contain, are adjacent to, or whose sewer service or property access will be impacted by the Work as specified in Section 01 35 14, Notification Procedures.

D. List and corresponding digital images, in accordance with Paragraph 3.1, Section 33 01 30.16, Television Inspection of Sewers, and Section 33 01 30.41, Cleaning of Sewers, of lateral taps containing obstructions that prevent the installation of the liner. For each such tap connection, submit a screen shot image clearly showing the extent of obstructions. Submit images in electronic format, labeled and organized in a manner to easily retrieve the image for the lateral tap in question. The list of obstructions shall include upstream and downstream manhole numbers, station, description of obstruction, and, if applicable, property address served, plan sheet number where tap is located and photograph of outside cleanout, if present.

E. Cured-In-Place Lateral Liners:
1. The names of the resins and strands/fibers/mats/tubes manufacturers.
2. Independent third party ISO 17025 accredited laboratory test reports identifying by name and demonstrating that the exact resin and, if utilized, strands/fibres/mats/tubes to be used for this project meets the requirements for initial structural properties, including short-term flexural modulus of elasticity, short-term flexural strength (bending stress), and tensile strength, (performed in accordance with ASTM F1216 and ASTM D790 and/or ISO 178 with a wall thickness measured per DIN EN 13566-4) and chemical resistance (performed in accordance with ASTM F1216-Appendix X2 or ASTM D5813).
3. Independent third party accredited laboratory test reports identifying by name and demonstrating that the exact resin and, if utilized, strands/fibres/mats/tubes to be used for this project has been tested for long-term flexural modulus of elasticity and long-term flexural strength (i.e., 10,000 hour minimum creep testing performed in accordance with ASTM D2990/DIN EN 761 for design conditions applicable to this project).
    a. If the data submitted is not for the exact liner to be used on this project, submit a detailed description of the physical properties of both the liner used in the test and the liner to be used for this project to demonstrate that the two liners are comparable in terms of physical properties.
    b. If performance test data for previously installed liners using the proposed resins are available from any source, submit these data as well as the test data for laboratory prepared samples.
    c. Test will be performed for a minimum of 10,000 hours under test conditions and loadings described below. Independent third party test data of the entire ASTM D-2990/DIN EN 761 data set are required as substantiation of the values used in design. The data points from 1,000 hours to 10,000 hours

(or longer, if these data are available), or such other time period as determined by the ENGINEER based on the curve or slope of the plotted data, of the Long-term Flexural Modulus shall be extrapolated using a Microsoft Excel log-log scale linear regression analysis, unless ENGINEER determines that the data set better suit another regression method, to determine the service life performance characteristics of the proposed liner.

d. Testing will be conducted at:
   i. Temperature: 21 to 25°C
   ii. Relative humidity: 50% minimum
   iii. Load: Equivalent to 25% of the initial yield stress measured in accordance with ASTM D790/ISO 178, or as approved by ENGINEER.

4. For liners installed in multiple pieces/shots, whether constructed of identical materials or dissimilar materials, independent third party accredited laboratory test reports demonstrating that the overlap joint between the exact resins and liners to be used for this project has been tested for lapshear testing in accordance with ASTM D5868 or ASTM D3163 and that the joint exhibits shear properties equal to or greater than the weaker of the two overlapped liner materials (i.e. that the substrate fails before the lapped joint).
5. The type and volume of catalysts and promoters added to the resin, the time of addition, the method of incorporation into the resin, and the quality control procedures required to ensure adequate dispersal and minimization of air entrainment.
6. Manufacturer's Quality Control Plan and standard procedures that ensure proper materials are used in the resin impregnation process and in liner shipping and storage.
7. Installation and quality control plan, including:
   a. Bypass pumping plans
   b. Mainline and lateral sewer cleaning plan and cleanliness requirements
   c. Liner shot plan and sequence
   d. Liner installation standard procedures, including, but not limited to:
      1) Minimum and maximum allowable installation pressures and speeds
      2) Minimum and maximum allowable curing temperatures and pressures
      3) Minimum and maximum allowable heatup, curing, and cooling durations and speeds
      4) Intermediate manhole exposed liner restraining method
      5) Boiler pressure calculations (for non-circulating methods)
      6) Temperature monitoring plan
      7) Odor controls procedures
      8) Plan to manage flow from laterals during lining.
8. Individual liner lengths; transition locations; resin quantities; curing schedule for each liner, including heating, curing, and cool-down schedule; liner materials; thicknesses and layers; and inversion or spray application pressures (maximum and minimum) for each segment.
9. Submit structural design calculations and specification data sheets listing all parameters used in the liner design and thickness calculations based on

Appendix XI of ASTM F1216 for each pipe segment/lateral or for each lateral grouping of similar conditions (e.g. diameter, depth, ovality). All calculations shall be prepared under and stamped by a Professional Engineer registered in the State of Massachusetts.

F. Hydrophilic end seal material to be used and method of installation.

G. Contingency Plan, including methods and equipment to be used to repair unacceptable liner defects, for removing failed liners, and for availability and accessibility of backup equipment such as air compressors, lateral reinstatement cutters, and boilers.

H. Pre-Construction Inspection Deliverables, Post-Construction Inspection Deliverables and Warranty Inspection Deliverables in accordance with Section 33 01 30.16, Television Inspection of Sewers.

I. Quality control report for resin impregnation of each CIPLL showing information such as resin lot numbers, volumes of resin, and catalyst used. Include a checklist so that each critical step in the resin impregnation process is checked off and initialed.

J. Curing log of CIPLL temperature, if applicable, and pressure at each lateral during the curing process to document that proper temperatures and cure times have been achieved. Submit curing logs weekly.

K. Field Sample Preparation Plan outlining detailed procedure for preparing samples, including resin preparation, mixing, wetout, insertion, curing, cooling, and post-sample examination to confirm representativeness.

L. Name and location of ISO 17025 testing laboratory to perform CIPP tests, Provide certification that each test shall be performed by a laboratory with an American Association for Laboratory Accreditation (A2LA) for the specific test to be performed.

M. Performance Quality testing results.

PART 2 – PRODUCTS

2.1 APPROVED SYSTEMS

A. Provide full-wrap sewer lateral connection liners installed from the mainline sewer pipe. The system will require the product to be capable of being installed without access to the upstream side of the lateral pipe.
   1. Manufacturer:
      a. Shorty or T-Liner, as manufactures by LMK Enterprises, Inc.,

b. Service Connection Seal Plus Lateral Liner (SCS+L), as manufactured by BLD Services.,
c. Epros LCR Liner, as manufactured by Trelleborg, Inc.
d. Or equal.

2. Each Lateral Connection Liner shall extend a minimum of 5-feet from the mainline sewer into the lateral connection.

2.2 DESIGN REQUIREMENTS

A. Resin properties based on laboratory prepared samples
1. 50-Year Flexural Strength (ASTM D790, D2990, or DIN EN 761): 2,500 psi minimum.
2. 50-Year Flexural Modulus (ASTM D790, D2990, or DIN EN 761) based on laboratory prepared samples: 200,000 psi minimum, with no greater than a 55% reduction from initial (hour 0.02) strength.

B. CIPLL Thickness:
1. The required structural CIPLL wall thickness for the portion of the liner in the lateral shall be determined using:
a. ASTM F1216, Appendix X1, Design Considerations for a partially deteriorated host pipe condition in the lateral.
b. A minimum overall safety factor of 2.0.
c. A minimum service life of 50 years under continuous service.
d. A modulus of soil reaction of 850 psi.
e. A soil density of 120 lbs/ft^3.
f. A Poisson's ratio of 0.3.
g. A groundwater elevation over the pipe equivalent to surface grade.
h. An ovality of 6% in the lateral and 6% in the mainline, unless otherwise specifically stated on a case-by-case basis.
i. HS-20 live loading.
j. A soil depth equal to the depth of the upstream or downstream manhole on that pipe segment, whichever is deeper.
2. The long-term flexural modulus and long-term flexural strength used in the design shall be the values as rated for the specified service life and as submitted in Paragraph 1.8, except:
a. If performance test data for previously installed liners using the proposed resins are available, the long-term flexural modulus and long-term flexural strength values used in the design shall be the 30th percentile of the available data set.
b. If these test results were generated from laboratory prepared samples, the long-term flexural modulus and long-term flexural strength values used in the design shall be 30% of the value indicated by the laboratory tested samples.
c. If approved 10,000 hour data are not available, long-term flexural modulus and long-term flexural strength retention used for design thickness shall be 15% (85% reduction) of the short term strengths.

d. CONTRACTOR may elect to use weaker long-term flexural modulus and long-term flexural strength values than indicated in the submittal for these properties to account for differences in field prepared liners versus laboratory prepared liners, so long as other requirements regarding limits to thickness are not compromised.

3. The liner thickness for each lateral shall be determined by the CONTRACTOR and submitted per Paragraph 1.8 of this Section.
4. In no case shall the portion of the liner in the lateral be thinner than 4.0 mm.

2.3 INSTALLED CHARACTERISTCS

A. The CIPLL shall be a one-piece system consisting of a portion in the main sealing the connection and a lateral tube. The main line portion of the CIPLL lining system shall be bonded to the inside of the mainline sewer and shall have a tee or wye lateral connection to match existing tap configuration. This portion shall extend a minimum of 5 inches on each side of the tap. The thickness of the mainline portion of the CIPLL shall be 3.0 mm, unless otherwise specified. The lateral insertion length of each CIPLL shall be a minimum of two (2) feet unless otherwise shown or specified. The mainline pipe may or may not have a liner installed.

B. The CIPLL system shall be a resin-impregnated, flexible felt, fiberglass scrim and reinforced needled felt, or equivalent material which is inserted into and around the lateral connection to be rehabilitated and cured-in-place by an acceptable method. The resin shall be suitable for the design conditions as well as the curing process. The CIPLL lining system shall be a complete, watertight lining installed from the mainline sewer, securing the connection between the lateral and the mainline sewer.

C. Field measure main, lateral, and outside drop diameters and lengths, including transitions in lateral diameters, and size liners accordingly. The liner shall be continuous in length and wall thickness shall be uniform.

D. The fabric and resin shall be as recommended by the liner manufacturer and shall result in a liner that passes the required performance tests.

E. The finished lateral liner shall be a complete, watertight lining from the mainline sewer, including the connection between the lateral and the mainline sewer, including hydrophilic waterstops at the tap, on the lateral liner 1 to 6 inches from the main, and one within 6 inches of the upstream end of the lateral liner.

F. When cured, the liner shall form a continuous, hard, impermeable liner that is chemically resistant to chemicals found in domestic sewage per ASTM F1216, Appendix X2 and abrasion resistance.

G. The liner shall be fabricated to a size that when reformed will tightly fit the sewer being rehabilitated. Allowance for longitudinal and circumferential expansion

shall be taken into account when sizing and installing the CIPLL. All dimensions shall be field verified by the CONTRACTOR prior to delivery of the applicable material. Where any space or gap between the outside surface of the CIPLL and the inside surface of the existing pipe exists as is visually evident or as determine using mandrel or laser profiling, if so specified, the CIPLL fit will be deemed deficient and corrective action will be required. Where irregularities of the existing pipe exists such as offset joints, protrusions, bumps, and deformations, and the irregularities remain after the sewer has been prepared in accordance with the Contract Documents, exception to the contact tolerance will be allowed in the irregularity zone. The exception shall not present an obstruction to sewage flow.

H. The CONTRACTOR shall be responsible for ensuring that the correct CIPLL is installed in each lateral connection being rehabilitated.

2.4 FABRICS/STRANDS/FIBERS/MATS/TUBES

A. The tube shall consist of one or more layers of flexible needled felt or an equivalent nonwoven or woven material, or a combination of nonwoven and woven materials, capable of carrying resin and withstanding installation pressures and curing temperatures. The tube shall be compatible with the resin system used. The material shall be able to fit irregular pipe sections and negotiate bends, if applicable. If the tube contains fiberglass, the fiberglass shall be corrosion resistant E-CR glass conforming to ASTM D578.

B. The tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that may cause delamination. No dry or unsaturated layers shall be evident.

C. The tube shall be capable of conforming to offset joints, bells and deformed pipe sections up to 20% of original pipe diameter.

2.5 RESIN

A. The liquid thermosetting or ambient cure resin shall saturate the tube and produce a properly cured liner.

B. Polyester, vinyl ester, or epoxy resin and catalyst systems are acceptable. The resin must be able to cure in the presence of water and the initiation temperature for cure, if applicable, should be less than 180°F (82.2°C).

C. The method of cure may either be from a manufacturer recommended heat source, light cure, or by ambient temperature. Method of cure instructions along with a cure log shall be on-site at all times.

D. The wall color of the interior pipe surface after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.

2.6 HYDROPHILIC SEALS

A. Provide hydrophilic end seals to prevent water from migrating between the CIPLL and mainline pipe. Provide one of the following as recommended by CIPLL system manufacturer:
   a. Product and Manufacturer:
      i. 2 mm thick Insignia Connection Hat, as manufactured by LMK Technologies.
      ii. 2 mm thick Insignia O-Ring, as manufactured by LMK Technologies
      iii. Or equal.

PART 3 – EXECUTION

3.1 PREPARATION

A. Lateral lining shall only occur after the corresponding mainline sewer has been lined, tested, and approved by the ENGINEER. If the corresponding mainline sewer is not going to be lined, lateral lining shall proceed in accordance with the approved schedule of work. Ensure the proper sequence of work between the mainline and lateral lining activities.

B. Review available survey television inspection logs and/or conduct additional inspection of the lateral lines to plan rehabilitation work.

C. Clean laterals and mainline sewer prior to Pre-Construction Inspection, such that the pipes are free of roots, grease, sand, rocks, sludge and other debris. Cleaning shall conform to the requirements of Section 33 01 30.41, Cleaning of Sewers. Clear the lateral line and main line of obstructions such as solids or broken pipe that will prevent the insertion of the liner. If inspection reveals an obstruction that cannot be removed by the conventional cleaning equipment, notify the ENGINEER.

D. If cleaning cannot be performed as specified in the Contract Documents due to the existing condition of the laterals, notify ENGINEER prior to commencing Work.

E. Perform Pre-Construction Inspection of laterals to be lined in accordance with Section 33 01 30.16, Television Inspection of Sewers, and submit to ENGINEER.

F. Notify ENGINEER in writing of any obstructions between the mainline pipe connection and specified end of lateral liner and the approximate location of the obstruction, and indicate if unable to perform lining due to obstruction. All

distances shall be as measured from the mainline connection. CIPLL Pre-Construction Inspection submittals shall accurately locate all transitions, bend, and defects. Any discrepancies between the footage reported on the video inspection and on the report must be reconciled on the report by showing both distances. Any water or obstructions in the lateral must be removed prior to the inspection.

G. Inspect and confirm the inside diameter, alignment, length, ovality, and condition of each lateral at the main and up the lateral to at least 10-feet past the planned end of the liner. Use the data and information collected from this inspection to verify the size of the liner and refine the installation techniques. If unknown physical conditions in the work area that differ materially from those ordinarily encountered are uncovered during the investigation, the CONTRACTOR shall notify the ENGINEER.

H. If the existing lateral between the mainline sewer and the end of the scheduled length of liner is found to be damaged through no act of the CONTRACTOR, then notify ENGINEER. Any excavation and repair of the lateral shall be approved by the ENGINEER prior to commencement of an open-cut lateral repair and shall be paid under a Change Order.

I. Visually inspect lateral and main immediately prior to CIPLL lining to demonstrate that the lateral is clean and free of roots, grease, sand, rocks, sludge, or structural impediments that would affect long-term viability of the lateral liner. Visually inspect mainline sewer immediately prior to CIPLL lining to demonstrate that the mainline sewer is clean and free of impediments that would affect long-term viability of the lateral liner.

J. Follow notification requirements under Section 01 35 14, Notification Procedures.

3.2 LATERAL BYPASS PUMPING

A. Bypass pumping laterals will not be a readily available alternative as cleanout access is not expected on CIPLL applications.

B. Notice to residents and businesses will be critical to prevent water use during CIPLL installation and to avoid sewer backups.
   1. Follow notification requirements under Section 01 35 14, Notification Procedures.
   2. Notify occupants immediately prior to CIPLL installation indicating the severity of the consequences of continued water use.
   3. Nighttime installation may be required where water use is critical to daytime operations of the applicable resident or business. Notify ENGINEER of any locations where nighttime installations may be required.

4. Upon completion of the work requiring interruption of service, immediately restore all services and notify the property owner(s) that service is again available.

C. The CONTRACTOR assumes all responsibility for notifying property owners of service interruptions. The CONTRACTOR also assumes all responsibility for blockages, back-ups, or damages caused to public or private property as a result of the interruption of service, whether caused by the CONTRACTOR'S or property owner's actions.

3.3 CIPLL INSTALLATION

A. The flexible fabric shall be impregnated with the resin in accordance with manufacturer's instructions. For each installation, provide ENGINEER with a field-cured resin impregnated wick to provide verification of the curing process. Liner wet out may not be done on any surface whose temperature is greater than 70ºF.

B. Install hydrophilic end seals and, if applicable, in accordance with manufacturer's instructions.

C. Provide flow control sufficient to allow CCTV observation of mainline packer throughout CIPLL installation.

D. Install CIPLL liner into lateral in accordance with manufacturer's instructions.

E. Protect the resin-saturated flexible fabric during positioning and installation. No resin shall be lost by contact with manhole walls or pipe.

F. The system shall be loaded inside and/or on a pressure apparatus. The pressure apparatus, attached to a robotic device, shall be positioned in the mainline pipe at the service connection. The robotic device, together with a CCTV camera, shall be used to align the lateral portion of the system with the service connection opening. Air pressure, supplied to the pressure apparatus through an air hose, shall be used to invert or expand the resin impregnated CIPLL into the lateral pipe, and push the main-line portion of the system against the main-line pipe (typically lined pipe). The pressure shall be adjusted to the manufacturer's recommended installation pressure to fully install the CIPLL into the lateral pipe and hold the system tight to the pipe walls. Care shall be taken during the curing process not to over-stress the tube.

G. After insertion is complete, apply a suitable pressure to maintain the form of the CIPLL during cure. Apply air, steam, or water, as required by the CIPLL system manufacturer, uniformly throughout the CIPLL to achieve a consistent cure of the resin. Maintain the curing temperature/temperature rise recommended by the CIPLL system manufacturer and approved cure procedures. Prevent temperatures/temperature rise rates that could scald or bubble the liner. Scalded or blistered CIPLL will be rejected if, in the opinion of the ENGINEER, the performance of the liner is compromised.

H. Continue curing until the desired product is achieved.

I. During curing, provide controls to prevent odors from entering private residences and businesses.

J. Prevent air, steam, or curing water from entering the private residence at all times.

K. The initial cure shall be deemed to complete when the CIPP has been exposed to the UV light, heat source or held in place for the time period specified by the manufacturer.

L. If cured by ambient-cure process, the Contractor shall maintain bladder pressure until CIPLL has completely cured per manufacturer's recommendations before relieving the pressure in the pressure apparatus.

M. If heat cured, initiate a controlled cool-down to cool the hardened liner to a temperature below 110°F, in accordance with the approved cure procedures but in no case less than 30 minutes. Provide a view of the lateral liner contacting the lateral pipe from the beginning to the end of the repair.

N. After the curing process is complete, remove all installation and curing equipment from the host pipe. No material other than the cured CIPLL shall remain in the host pipe. Remove any frayed ends or excess liner material protruding into sewer main or manhole by remote robotic cutting equipment or manual means, in accordance with manufacturer's instructions. Capture and remove any solids produced, so that no material remains in the mainline pipe or flows downstream.

O. Notify the property owner(s) that flow from services is again available in accordance with Section 01 35 14, Notification Procedures. The CONTRACTOR assumes all responsibility for notifying property owners of service interruptions.

P. If return to service duration is longer than indicated on notices, then CONTRACTOR shall knock on doors of all affected properties to notify owner or tenant of the new anticipated return to service time.

Q. Provide a finished CIPLL that is free of any leakage and visual defects such as foreign inclusions, dry spots, pinholes, delamination, lifts, blisters, cracks, or wrinkles in any location in excess of 10% of the host pipe inside diameter. Verify there is no potential for obstruction of flow. The system shall not inhibit the closed circuit television post video inspection of the mainline or service lateral pipes.

R. Do not line over any branched connections in a lateral unless directed to on the Drawings or by ENGINEER. Branch lateral connections or any other pre-existing connection to the service lateral shall be reinstated by a remote controlled robotic cutting device from within the pipeline. The reinstated connection shall be brushed to allow for a smooth edge.

3.4 POST-CONSTRUCTION INSPECTION OF COMPLETED WORK

A. Conduct Post-Construction Inspection and provide video documentation showing completed work in accordance with Section 33 01 30.16, Television Inspection of Sewers. Perform Post-Construction Inspection immediately following completion of lining work and no later than 60 days after the completion of lining work. Perform Post-Construction Inspection after all lateral lining work is complete in the pipe segment.

B. Correct all defects discovered during the Post-Construction Inspection before CIPLL conditional acceptance. After the defects are corrected, repeat the Post-Construction Inspection for that CIPLL at no additional cost to the Owner.

3.5 FINAL CLEANUP

A. Upon completion of rehabilitation work, clean and restore project area affected by the Work to a condition at least equal to that which existed prior to the start of the Work.

3.6 QUALITY CONTROL TESTS

A. Material Sampling
   1. Construct an above-grade Tee-fitting mockup for each restrained sample in which a liner can be installed using similar methods as below-grade. Hydrophilic end seals do not need to be installed for these samples, unless specifically requested by ENGINEER during sampling. Select material and size of PVC host pipe for restrained sample to match the inside diameter of the main and lateral being rehabilitated as close as reasonably practicable. The lengths of the main and lateral pipes shall be of sufficient length to install the liner in a similar fashion as below-grade. The lengths of the main and lateral pipes shall be of sufficient length to install the liner in a similar fashion as below-grade. Cure the sample in the same manner as the installed liners. The portion of the sample to be tested is the lateral portion from the tap to the end of the sample.
   2. Prepare cure, and provide to ENGINEER one restrained sample at frequencies specified in Paragraph 3.6., in a manner that represents the conditions experienced during installation of the in-ground liners and in accordance with the Field Sample Preparation Plan submitted in Paragraph 1.8.
   3. The sample submitted shall have the main portion cut a minimum of two inches beyond the maximum dimension of the mainline portion of the liner. The lateral portion of the sample shall be a minimum of 3 feet long.
   4. Cut two cylindrical samples from the center of the restrained pipe sample. Each sample shall be a minimum of 12 inches long. Label samples with the contract number, date of installation, lateral address, segment number(s), and specified thickness. Send one sample to independent third party laboratory for testing.

Deliver the second sample to ENGINEER. CONTRACTOR may elect to take additional samples at no additional cost to the OWNER.

B. Testing: The following tests at the following minimum frequencies will be performed by the /CONTRACTOR. If more than one sample of a tube/resin/installation methods is collected and tested over the course of the Work, the average of the sample results will be considered representative of all the liners installed for that particular resin-fabric combination. For example, 4 samples of a particular tube/resin/installation method combination are analyzed for flexural strength; the results are 2000, 4500, 5500, and 6000 psi. The average flexural strength is 4500 for liners constructed from this tube/resin/installation method combination. The OWNER or the CONTRACTOR may elect to perform additional testing, at his discretion and cost, to improve the resolution of performance test characterization. All testing shall be performed by an independent, accredited ISO 17025 testing facility. Each test shall be performed by a laboratory with an American Association for Laboratory Accreditation (A2LA) for the specific test to be performed.

1. Short-term Flexural (Bending) Properties – The initial tangent flexural modulus of elasticity and flexural yield strength measured in accordance with ASTM D790.
   a. Frequency – 1 test per every 15 laterals lined (minimum of three).
2. Thickness measured in accordance with ASTM D3567.
   a. Frequency – 1 test per every 15 laterals lined (minimum of three).
3. Long-term Flexural Modulus of Elasticity retention measured in accordance with ASTM D2990 or DIN EN 761. Test will be performed for a minimum of 10,000 hours under test conditions and loadings described below. The data points from 1,000 hours to 10,000 hours, or such other time period as determined by the ENGINEER based on the curve or slope of the plotted data, of the Long-term Flexural Modulus shall be extrapolated using a Microsoft Excel log-log scale linear regression analysis to determine the minimum service life performance of the resin-fabric.
   Testing will be conducted at:
   a. Temperature: 21 to 25°C.
   b. Relative humidity: 50% minimum.
   c. Load: Load used in ASTM D2990/DIN EN 761 testing as submitted in accordance with paragraph 1.8.A.5.
   d. Frequency – 1 test per every 50 laterals lined (minimum of 1).
4. Chemical Resistance - The chemical resistivity of the liner measured in accordance with ASTM F1216, Appendix X2.
   a. Frequency – 1 test per every 50 laterals lined (minimum of 1).

3.7 CIPLL ACCEPTANCE

A. Acceptance of the CIPLL shall be based on the ENGINEER's evaluation of the resin impregnation quality control reports, CIPLL temperature curing logs,

laboratory test results for the prepared samples, and Post-construction Inspection video, which shall demonstrate:

1. Compliance with the required physical strength properties and thickness.
    a. For each pipe segment, the calculated required thickness of the liner based on the installed material properties will be determined using the actual installed liner thickness and material properties as measured by the quality control tests required in Paragraph 3.7 and appropriate applicable formula from ASTM F1216, Appendix X1. The measured short term flexural strength and short term flexural modulus of elasticity will converted into long term flexural strength and long term flexural modulus of elasticity by using the percent retention value achieved by the representative long term flexural modulus of elasticity testing.
2. Compliance with the required chemical resistance properties.
3. There is no evidence of groundwater infiltration through the body of the CIPLL, or at the interface with the main/tap, or at the lateral end of the CIPLL.
4. There is no evidence of excessive wrinkles, splits, cracks, breaks, lifts, kinks, scalds, blisters, delaminations, or crazing in the liner.
5. Compliance with required length and diameter of liner.

B. If any defective CIPLL is discovered after it has been installed, it shall be removed and replaced with either a sound CIPLL or a new pipe at no additional cost to the OWNER. Obtain approval of the ENGINEER for method of repair, which may require field or workshop demonstration.

C. For CIPLL with defects:
    1. If the CONTRACTOR elects to excavate and repair defects in the CIPLL, cut and remove the defective section of CIPLL plus the host pipe to a minimum of two feet beyond each end of the defective CIPLL . Use SDR 26 or Schedule 40 PVC to replace the removed liner and host pipe. On either side of the proposed repair, carefully remove the host pipe from around the existing sound liner to expose a minimum of five inches of sound liner. Use stainless steel shielded flexible repair couplings to connect the new PVC directly to the sound liner. Provide repair couplings custom-fabricated specifically to fit the outside of the materials being connected. Complete repair, pipe installation, bedding, and backfill in accordance with the Details on the Drawings.
    2. If the CONTRACTOR elects to repair defects in the CIPLL using trenchless methods, submit method to ENGINEER for approval. The method must prevent infiltration from entering lateral and shall not cause a significant reduction in lateral cross-sectional area as compared to the lined portion of lateral.

3.8 WARRANTY INSPECTION

A. Provide a CCTV inspection approximately 18 to 24 months after completion of CIPLL work for 100% of the total cured-in-place lateral liners installed. All CCTV inspection shall be completed in accordance with Section 33 01 30.16, Television

Inspection of Sewers, and shall be completed in the presence of the ENGINEER. Actual period for inspection shall be determined by the ENGINEER and will ideally be conducted during high groundwater conditions. CONTRACTOR will be provided with a 60-day notice prior to period of inspection. Conduct all inspections in the presence of the ENGINEER.

B. All defects discovered during the television inspection shall be corrected by the CONTRACTOR at no additional compensation. Observed leaks through the liner or at the interface with the host pipe in the lateral or main will be considered defects. After the defects are corrected, the sewer and laterals shall be inspected again, immediately after repairs are made and again within the warranty inspection time frame indicated above, at no additional compensation. All re-inspection and repairs of defective materials or workmanship shall be completed at no cost to the OWNER.

C. For CIPLL liners that did not meet specification and a negotiated reduction in price was agreed upon by the CONTRACTOR and the OWNER prior to conditional acceptance, this out-of-specification condition becomes the basis upon which future corrective actions during the six-month retained percentage period and warranty period is based. The physical record of said condition will be the Post-Construction Inspection. Only defects beyond those in place at the time of the negotiated price reduction will be considered the CONTRACTOR's responsibility during these periods.

D. If additional defects are discovered during the six-month retained percentage period or warranty period, the OWNER will request the CONTRACTOR to correct these additional defects or request an additional price reduction. If, in correcting these defects, the CONTRACTOR corrects the previous defects (for which the negotiated reduction was incurred), the OWNER shall pay the CONTRACTOR the difference between the originally negotiated reduced value of the liner and the new, improved/corrected value of the liner, the value of which will be solely determined by the ENGINEER. No payment over 100% of the bid price of the liner will be made.

E. The OWNER continues to retain the right to either demand that corrective action to address the additional defects be completed or to offer the CONTRACTOR a further negotiated reduction in the value of the liner. The CONTRACTOR continues to retain the right to correct the defective liner at any point during the six-month retained percentage period and warranty period and receive full payment for the liner. The acceptability of all repairs and the finished value of liner after said repairs continue to be solely the ENGINEER's determination.

3.9 LINING SUMMARY

A. A table showing lateral connections to be lined is shown on the Contract Drawings.

B. All manhole depths indicated on the Contract Drawings are approximate and shall be field verified.

C. Host pipe diameters listed are considered to be nominal diameter and shall be field verified.

D. Locate and verify presence of transitions in laterals.

++END OF SECTION++

SECTION 33 01 30.81

MANHOLE REHABILITATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all labor, materials, equipment, power, water, and incidentals necessary to rehabilitate manholes and seal watertight cured-in-place pipe ends. Manhole rehabilitation includes structural repairs, and modifications to prevent infiltration of groundwater, inflow from surface water, and entrance of soil or debris.

B. The extent and type of Work is shown on the Drawings.

C. Field verify all Work locations and all other adjacent and relevant utility locations or other pertinent site conditions prior to any work.

D. Manholes identified on the Drawings to be rehabilitated or to have their frames and covers replaced or reset are included in the Work described in this Section.

E. CONTRACTOR shall be responsible for obtaining and complying with all required permits.

1.2 RELATED SECTIONS

A. Section 01 41 28, Confined Space Entry Permit

B. Section 01 51 41, Temporary Pumping

C. Section 01 73 29, Cutting and Patching

D. Section 32 12 00, Flexible Paving

E. Section 33 01 30.41, Cleaning of Sewers

1.3 REFERENCE STANDARDS

A. Comply with applicable provisions and recommendations of the following:

1. ASTM A 48, Standard Specification for Gray Iron Castings.
2. ASTM C 32, Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale).
3. ASTM C 33, Standard Specification for Concrete Aggregates.
4. ASTM C 78 – Standard Test Method for Flexural Strength of Concrete (Third point loading).
5. ASTM C 109, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.

6. ASTM C 139, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
7. ASTM C 150 - Standard Specification for Portland Cement.
8. ASTM C 267 - Standard Test Methods for Chemical Resistance of Mortars, Grouts, and Monolithic Surfacings and Polymer Concretes
9. ASTM C 293, Test Method for Flexural Strength of Concrete.
10. ASTM C 309, Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.
11. ASTM C 321, Test Method for Bond Strength of Chemical-Resistant Mortars.
12. ASTM C 443, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
13. ASTM C 478, Standard Specification for Precast Reinforced Concrete Manhole Sections.
14. ASTM C 469 - Standard Test Method for Static Modulus of Elasticity and Poisson's Ration of Concrete in Compression.
12. ASTM C 596, Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement.
13. ASTM C 666, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
14. ASTM C 882, Standard Test Method for Bond Strength of Epoxy-Resin Systems used with Concrete by Slant Shear.
15. ASTM C952 – Standard Test Method for Bond Strength of Hydraulic Cement Mortars.
16. ASTM C 1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.
17. International Concrete Repair Institute (ICRI) Technical Guidance 310.2.
18. ASTM D 412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
19. ASTM D 543, Resistance of Plastics to Chemical Agents.
20. ASTM D 638, Standard Test Method for Tensile Properties of Plastic.
21. ASTM D 695, Compressive Properties of Rigid Plastic.
22. ASTM D 790, Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
23. ASTM D 903, Standard Test Method for Peeling or Stripping Strength of Adhesive Bonds.
24. ASTM D 1004, Standard Test Method for Tear Resistance of Plastic Film and Sheeting.

25. ASTM D 2240, Standard Test Method for Rubber Property- Durometer Hardness.
26. ASTM D 2584, Volatile Matter Content.
27. ASTM D 2990-01 - Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.
28. ASTM D 4414, Wet Film Thickness by Notched Gages.
29. ASTM D 4541, Pull-off Strength of Coatings Using a Portable Adhesion Tester.
30. AWWA 302, Reinforced Concrete Pressure Pipe, Noncylinder Type.
31. ISO 178 - Determination of Flexural Properties.
32. ASTM G 62 – Standard Test Methods for Holiday Detection in Pipeline Coatings
33. ASTM D 7234 – Test method for Pull-off Adhesion Strength of Coatings on Concrete using Portable Pull-off Adhesion Testers
34. International Concrete Repair Institute (ICRI) Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.
35. National Association of Corrosion Engineers (NACE) SP0188-2006, Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
36. NACE, The published standards of National Association of Corrosion Engineers (NACE International). Houston, TX.

1.4 QUALIFICATIONS

A. CONTRACTOR shall be licensed and certified by the manufacturer of each lining system to be installed.

B. CONTRACTOR shall have the following product-specific qualification requirements.

1. Cement Liners
    a. Completed lining of at least 30 manholes using the proposed products and application methods.
    b. All Work must be supervised by a foreman responsible for rehabilitating a minimum of 20 manholes using the proposed manufacturer’s lining process.
2. Non-reinforced or Strand/Fiber Reinforced Resin-based Liners
    a. Completed lining of at least 30 manholes using the proposed products and application methods.

b. All Work must be supervised by a foreman responsible for rehabilitating a minimum of 20 manholes using the proposed manufacturer's lining process.

3. Injection Grouting

a. Completed injection grouting for least 20 manholes using the proposed products and application methods.

b. All Work must be supervised by a foreman responsible for rehabilitating a minimum of 15 manholes using the proposed manufacturer's products and processes.

1.5 QUALITY CONTROL

A. No change of material, design values, or procedures specified herein may be made during the course of the Work without the prior written approval of the ENGINEER.

B. All laboratory test results shall be provided by an independent, accredited ISO 17025 testing facility.

1.6 WARRANTY

A. All work shall be fully guaranteed by the CONTRACTOR for a period of 5 years from Substantial Completion. During this period, all defects discovered by the OWNER or ENGINEER shall be addressed by the CONTRACTOR in a satisfactory manner at no cost to the OWNER. In addition to the Warranty Inspections specified under Section 3 in this Specification, the OWNER may conduct additional independent inspections, at its own expense, of the Work at any time prior to the completion of the guarantee period.

1.7 SUBMITTALS

A. Field testing equipment and procedures for each type of material/process/product proposed:

1. Spark/Faraday testing
2. Thickness testing
3. Material testing

B. Sewage bypass plans by individual location or type, as appropriate to the work.

C. Notices to customers whose sewer service will potentially be interrupted.

1. Notice to be distributed 1 week prior to service interruption.
2. Second notice to be distributed 24 to 48 hours prior to service interruption.
3. Third notice immediately prior to disruption of service.

4. Fourth notice shall be immediately after return of normal service.
5. Notices shall include at a minimum the date of notice distribution; the date and times of cured-in-place pipe lining construction; a description of construction and limitation to water use; CONTRACTOR'S name, telephone number, and the project coordinator to contact for additional information and inquiries; and three contact numbers of the CONTRACTOR for emergencies.
6. Any other notifications to property owners whose properties contain, are adjacent to, or whose sewer service or property access will be impacted by the Work as specified in Section 01 35 14, Notification Procedures.

D. Manhole cleaning tools, nozzles, equipment operating pressure range, and chemicals

E. Manufacturer information for all products CONTRACTOR proposes to utilize:
1. Manufacturer warranty information
2. Surface preparation instructions, with notes and rationale for proposed variances from requirements specified herein
3. Application instructions
4. Installation and quality control plan

F. Concrete Related Products
1. Concrete mixture – product data sheet, material properties
2. Joint and crack sealant – product data sheet
3. Manhole steps – product data and dimension sheet
4. Precast concrete manufacture location and cut sheets for each component showing loading capacities, shape, reinforcement, anchor bolts, and dimensions
5. Mortar – product data sheet, material properties
6. Concrete and frame sealants – product data sheet
7. Rubber or HDPE ring and frame sealants – product data sheet
8. Frame and cover – product data and dimensions sheet
9. Hydraulic cement – product data sheet, material properties
10. Wall profiler – product data sheet, material properties, period to cessation of off-gassing

G. Fiber Reinforced Cement Liners (FRCL)
1. Summary table of FRCL material properties at proposed FRCL component mixture ratios, including flexural modulus of elasticity, flexural strength, bond strength, period to cessation of off-gassing.

2. Additives – make, model, rates, mixing methods
3. Surface primer – make, model, rates, application method, and application rate
4. Any proposed deviations from specified installation requirements
5. Individual liner specifications, including length, component quantities, thicknesses, layers, cure times, materials, material demand for each manhole, and spray application pressure (maximum and minimum) for each manhole/structure.
6. Structural design calculations and specification data sheets listing all parameters used in the liner design and thickness calculations. All calculations shall be prepared under and stamped by a Professional ENGINEER registered in the State of Massachusetts.
7. Required nozzle velocity to ensure compaction, minimum and maximum nozzle distance from surface to achieve proper compaction, and test equipment/methods to field verify.
8. Repair methods and equipment to be used to repair unacceptable liner defects and for removing failed liners.

H. Epoxy Lining System

1. Material properties
2. Material demand for each manhole/structure
3. Surface primer – make, model, rates, application method, and application rate
4. Cure times, and cure time before holiday testing
5. Voltage for holiday testing
6. Repair methods and equipment to be used to repair unacceptable defects.

I. Injection Grouting

1. All grouts proposed by CONTRACTOR – product data sheet
2. Shrink control agent – product data sheet, rate added by gallon/pound of grout
3. Root control agent – product data sheet, rate added by gallon/pound of grout

J. Resin-based Liners:

1. Summary table of material properties, including short-term flexural modulus of elasticity, 50-year flexural modulus of elasticity, short-term flexural strength (bending stress), 50-year flexural strength (bending stress), chemical resistance, and hardness. Submit certified test reports verifying each value as described below.
2. Independent third party ISO 17025 accredited laboratory test reports demonstrating that the exact resin and, if utilized, strands/fibers/mats/tubes proposed to be used for this project has been tested for long-term flexural

modulus of elasticity and long-term flexural strength (i.e. 10,000 hour minimum creep testing performed in accordance with ASTM D2990 or DIN EN 761 for design conditions applicable to this project). If the data submitted is not for the exact liner to be used on this project, submit a detailed description of the physical properties of both the liner used in the test and the liner to be used for this project to demonstrate that the two liners are comparable in terms of physical properties.

a. Test will be performed for a minimum of 10,000 hours under test conditions and loadings described below. Independent third party test data of the entire ASTM D-2990/DIN EN 761 data set are required as substantiation of the values used in design. The data points from 1,000 hours to 10,000 hours, or such other time period as determined by the ENGINEER based on the curve or slope of the plotted data, of the Long-term Flexural Modulus shall be extrapolated using a Microsoft Excel log-log scale linear regression analysis to determine the service life performance characteristics of the proposed liner.

b. Testing will be conducted at:

    i. Temperature: 21 to 25°C

    ii. Relative humidity: 50% minimum

    iii. Load shall be equivalent to a load that is 25% of the yield stress as measured by ASTM D790 or ISO 178, or as approved by ENGINEER.

3. The names of the strands/fibers/mats/tubes and resin manufacturers.

4. The type and volume of catalysts and promoters added to the resin, the time of addition, the method of incorporation into the resin, and the quality control procedures required to ensure adequate dispersal and minimization of air entrainment.

5. Structural design calculations and specification data sheets listing all parameters used in the liner/coating design and thickness calculations. All calculations shall be prepared under and stamped by a Professional ENGINEER registered in the State of Massachusetts.

6. Quality control report for resin of each liner/coating showing information such as resin lot numbers, volumes of resin, and catalyst used. Include a checklist so that each critical step in the resin impregnation process is checked off and initialed.

7. Surface primer – make, model, application method, application rate

8. Surface profiler – make, model, application method, application rate

9. For resin-based fabric systems, minimum and maximum allowable installation pressures and speeds, minimum and maximum allowable curing temperatures, pressures, and curing durations and speeds.

10. For spray-applied systems, application rates, maximum single layer built thickness, maximum built thicknesses, and curing durations and speeds.
11. Individual liner lengths; transition locations; resin quantities; curing schedule for each liner, including heating, curing, and cool-down schedule; curing time before holiday testing; liner materials; thicknesses and layers; and installation or spray application pressures (maximum and minimum) for each manhole/structure.
12. Sample collection and curing procedures.
13. Repair methods and equipment to be used to repair unacceptable liner/coating defects and for removing failed liner/coatings.

K. Name and location of ISO 17025 testing laboratory to perform tests. Provide certification that each test shall be performed by a laboratory with an American Association for Laboratory Accreditation (A2LA) for the specific test to be performed.

L. Post-construction and Testing Deliverables, including:
1. Visual Inspections
2. Thickness test results
3. Spark/Faraday test results
4. Material test results

M. Warranty Inspection Deliverables

1.8 REQUIREMENTS

A. This Contract requires work in active sewers. Follow all federal, state and local requirements for safety in confined spaces.

B. Conduct worker safety training within one year prior to start of work that includes reviewing the hazards associated with all equipment, materials, and work practices. Additional safety considerations including safely handling, mixing, and transporting of reagents should be provided by the liner manufacturer, and should include safe operating practices and procedures, appropriate personal protective equipment (PPE) for the various lining operations, and proper storage, transportation, mixing, and disposal of resins, additives, and their associated containers.

PART 2 – PRODUCTS

2.1 CONCRETE COLLARS

A. In paved areas, provide collars constructed using CTDOT Class A 4,500 psi concrete and Town requirements.

B. In unpaved areas, provide collars constructed using a concrete mixture with a minimum unconfined compressive strength of 3,000 psi.

2.2 PRECAST MANHOLE CONES

A. Except where otherwise specified, precast cones shall consist of reinforced concrete pipes sections especially designed for manhole construction and manufactured in accordance with ASTM C 478, except as modified herein.

B. Precast cone sections shall be manufactured by wet cast methods only, using forms which will provide smooth surfaces free from irregularities, honeycombing, or other imperfections.

C. The circumferential and longitudinal steel reinforcement shall extend into the bell and spigot ends of the joint without breaking the continuity of the steel.

D. All precast cones shall be of approved design and of sufficient strength to withstand the loads imposed upon them. Precast cones shall be designed for a minimum earth cover loading of 130 pounds per cubic foot and (1) an H-20 wheel loading plus 30 percent in roadways for impact or (2) an H-20 wheel loading plus 15 percent in rights-of-way for impact. Wall thickness shall be as recommended by the manhole manufacturer and in no case less than 5-inches.

E. Lifting holes, if used, shall be tapered, and no more than two shall be cast in the cone section. Furnish tapered, solid rubber plugs to seal the lifting holes. The lifting holes shall be made to be sealed by plugs driven from the outside face of the section only.

F. Mark date of manufacture and name of trademark of manufacturer on inside of cone.

2.3 GRADE RINGS AND SEALANTS

A. Grade rings for manholes shall be constructed of a rubber / fiber polyurethane pre-polymer composite manufactured from recycled materials or precast concrete, as specified. Select inside diameter of grade ring to match inside diameter of chimney.

B. Select thickness of grade rings in order to minimize the number of grade rings required to achieve proper grade. Various thicknesses and tapers shall be available on site when performing Work to make all grade adjustments.

C. Precast concrete grade rings shall be made with ASTM C150, Type II cement with limestone aggregate and have the following properties:

1. Design Strength (ASTM C 478): 4,000 psi in 28 days
2. Impact and Loading: H20 Traffic Rated by AASHTO Standard Specification for Highway Bridges
3. Reinforcing Wire: 6 Gauge

D. When frame is required to be bolted to manhole, provide bolt holes in grade rings. Bolt holes for concrete grade rings shall be cast into the grade rings. Bolt holes for rubber grade rings can be field drilled using a hole saw.

E. Rubberized grade rings shall be Flex-O-Ring manufactured by Highway Rubber and Safety Inc., Infra-Riser manufactured by East Jordan Iron Works, or equal.

F. Precast concrete grade rings shall be manufactured by Atlantic Concrete Products, or equal.

G. Provide a sealant suitable for attaching grade rings to each other, frame and manhole. Sealant shall be 100% silicone or polyurethane or Dura-Plate Butyl-Lok model MT329 by Atlantic Concrete, or equal and suitable for use with masonry, concrete, metal, and recycled rubber.

2.4 MANHOLE STEPS

A. Manhole steps shall be constructed of copolymer polypropylene with 1/2-inch grade 60 steel reinforcement in accordance with the Details on the Drawings.

B. Leg end of step shall be tapered.

C. Product and Manufacturer

1. PSI-DI, MA Industries; or equal.

2.5 MASONRY MATERIALS

A. New brick shall conform to the requirements of ASTM C 32, Grade MS for manhole brick.

B. New concrete blocks shall be machine-made, solid segmental blocks shaped so that the completed structure in which they are used will conform to the original manhole internal shape or as otherwise approved. Blocks shall be of compact texture and like blocks shall be uniform in shape and size. Concrete blocks shall conform to ASTM C 139.

C. Mortar:

1. Two-component, polymer-modified, cementitious mortar that has the following minimum properties:
   a. Comprehensive Strength(ASTM C 109): 3000 psi in 1 day; 7000 psi in 28 days
   b. Flexural Strength (ASTM C 293): 2000 psi in 28 days
   c. Freeze/Thaw Resistance (ASTM C 666): 300 cycles 98%

2.6 FRAMES AND COVERS

A. Manhole frames and covers tolerance shall be indicated as +/- 1/16 inches except as noted on the Details on the Drawings.

B. All covers shall be made from gray cast iron, tough, even-grained and free from all flaws and injurious or unsightly defects, and shall be in accordance with ASTM A 48, Class 35B.

C. Provide covers with flush letters as shown on the Details on the Contract Drawings. Covers shall be labeled with the designation “AYER” and year of construction.

D. Do not coat castings with paint or any other material. Manhole sets shall have interchangeable frames and covers.

E. Inspect all manhole frames and covers at the jobsite. No frame or cover may be installed unless it has been marked “Approved by ENGINEER.”

F. Where designated or approved by the ENGINEER, existing manhole frames and covers may be reused. All lids which are not properly set and do not lie solid after construction is finished will be destroyed and must be replaced with new lids.

G. Frames and covers: Designed to withstand an AASHTO H20 traffic loading.

H. Frames and covers shall be self-sealing with a machined groove and O-ring

H. Manufacturer:
   1. Campbell Foundry, Model 1202B.
   2. Or approved equal.

2.7 ANCHOR BOLTS

A. Anchor bolts, if required and specified, for bolting manhole frame to the manholes shall be 3/4-inch diameter all-thread galvanized steel rods. Anchors for attaching frame to existing manholes shall be epoxy anchors or approved mechanical anchor.

Anchor bolts shall extend a minimum of two-inches above the frame. Provide galvanized steel nuts.

2.8 CLEANING MATERIALS

A. Water: Potable water.

B. Cleaners: Detergent, bleach, and muriatic acid.

2.9 HYDRAULIC CEMENT

A. Hydraulic cement shall be a dense, rapid setting, cementitious product specifically formulated for leak control in compressive applications. It shall have the following minimum physical properties:

1. Comprehensive (ASTM C 109): ..... 600 psi, 6 hours;
   2000 psi, 24 hours

2. Shrinkage (ASTM C 596): ..... <0.06%

3. Bond Strength (ASTM C 321): ..... 40 psi, 1 hour;
   80 psi, 24 hours

B. The hydraulic cement shall require no additives, shall set in 45-90 seconds, and shall be dimensionally stable, freeze/thaw resistant and sulfate resistant.

C. Product and Manufacturer

1. As recommended by manufacturer of the lining or coating manufacturer;
2. Strong Seal Strong Plug by the Strong Company;
3. PermaCast Plug, APM;
4. MainStay ML 10, Madewell;
5. Quad-Plug by Quadex;
6. Or approved equal.

2.10 PROFILING CEMENT MORTARS

A. Cement mortar used to smooth substrate prior to application of topcoats of liners or coatings shall be chemically compatible with topcoat materials, bond to substrate and topcoat of the specific structure, and be specifically formulated by manufacturer of the topcoat as a profiling mortar. Profiler shall utilize appropriate bonding agents to prepare the substrate prior to application. Under no circumstances will expanding/hydraulic cements be used as parge or profiling layers under topcoats of liners or coatings. Profiling cement mortars shall have the following minimum physical properties:

1. Compressive Strength (ASTM C 109): 3000 psi, 24 hours; 5000 psi, 28 days
2. Bond Strength (ASTM C 882): 1800 psi, 28 days
3. Flexural Strength (ASTM C 293): 850 psi, 28 days

B. Product and Manufacturer

1. As recommended by manufacturer of the lining or coating manufacturer.

2.11 CURED-IN-PLACE PIPE MECHANICAL END SEAL

A. Hydrophilic end seals that are specified in Section 33 01 30.72, Cured-in-Place Pipe Lining, shall be used as end seals for all cured-in-place pipe liners (CIPPL) unless otherwise directed by Engineer. If the hydrophilic end seal has failed or the CIPPL is required to end short of the manhole, a mechanical seal may be used only as directed by Engineer. Contractor shall obtain Engineer's approval prior to use of mechanical seal.

B. Provide mechanical seal consisting of a rubber seal and ANSI Type 316 stainless steels bands for securing end seal to CIPPL and the original host pipe.

C. CIPP mechanical end seal shall match the diameter of the existing CIPPs where it will be installed.

D. Product and Manufacturer:

1. Trelleborg Pipe Seals, Milford;
2. Or approved equal.

2.12 CORE DRILLED PIPE PENETRATION MECHANICAL SEAL

A. Provide modular, mechanical seal, consisting of rubber links shaped to continuously fill the annular space between the pipe and wall opening. System shall be corrosion resistant and designed for use as a permanent seal in sanitary wastewater environments.

B. Material Properties of Modular Seal Elements.

1. Material: EPDM
2. Hardness (ASTM D 2240): 50+/-5
3. Elongation (ASTM D 412): 400%

C. Bolts and Nuts shall be constructed of stainless steel (ANSI Type 316).

D. Product and Manufacturer.

1. Link-Seal Modular Seal Model S-316 as manufactured by Pipeline Seal and Insulator;
2. Or approved equal.

2.13 MANHOLE INJECTION GROUT

A. For low leakage sites with limited voids in backfill, use low viscosity urethane grout.

1. Product and Manufacturer:

   AV-254 Gelseal, Avanti; or equal (low viscosity urethane);

B. For low leakage sites with potential voids in the backfill, use urethane gel.

1. Product and Manufacturer:
   a. AV-350 MultiGel, Avanti;
   b. HydroActive Multigel, DeNeef;
   c. Flex-Grout 75, Cretex; or approved equal.

C. For medium leakage sites with limited voids in the backfill, use urethane foam.

1. Product and Manufacturer:
   a. Avanti AV-202 Multigrout, Avanti;
   b. HydroActive Sealfoam, DeNeef;
   c. HydroActive Safefoam, DeNeef [shall not be used in high movement sites (e.g., freeze zone, ongoing settlement];
   d. Flex-Grout 25, Cretex;
   e. Or approved equal.

D. For high leakage sites with potential voids in the backfill, use urethane expanding foam.

1. Product and Manufacturer:
   a. AV-310 Hydro Sealant, Avanti;
   b. HydroActive Cut, DeNeef;
   c. Fast-Grout 52, Cretex;
   d. AV-290 Fast-Set, Avanti
   e. AV-280 Hydrofoam, Avanti;
   f. Fast-Grout 52, Cretex;
   g. Or approved equal.

E. For pipe penetrations, use urethane grout.

1. Product and Manufacturer:

a. AV-333 Injectaflex, Avanti;

b. Or approved equal.

F. For root control, use dichlobenil as an additive to the grout in proportions as recommended by the manufacturer to prevent root growth.

1. Product and Manufacturer:

a. AC-50W Root Inhibitor, Avanti; or approved equal.

G. Shrink control agent – add a water-based emulsion with the grout to reduce shrinkage and improve strength of the grout providing the resultant cured material with both improved hydrostatic pressure resistance and flexibility. Add the agent in proportions as recommended by the manufacturer.

1. Product and Manufacturer:

a. AV-257 Icoset, Avanti; or approved equal.

2.14 FIBER REINFORCED CEMENT LINER – GENERAL DESIGN REQUIREMENTS

A. Minimum material properties

1. Flexural Strength at 24 hours (ASTM C293): 650 psi.

2. Flexural Modulus (ASTM C469): 200,000 psi.

3. Adhesion (ASTM D 7234): 350 psi or substrate failure

B. Thickness: Individual liner thicknesses shall be determined by the CONTRACTOR and submitted per Paragraph 1.7 of this Section. CONTRACTOR may elect to design and install multiple thickness liners for various diameters/configurations/depths within a given structure or install a uniform thickness within a given manhole based on the thickest required portion of the liner. The required minimum liner thicknesses shall be determined using the following:

1. For round configurations, use ASTM F1216, Appendix X1, formulas X1.1 and X1.2. For brick manholes, assume an ovality of 4%, and for precast concrete manholes, assume an ovality of 1% unless otherwise specified or shown.

2. For non-round or circular host structures with greater than 10% ovality, use WRc Sewerage Rehabilitation Manual, Type II Design, Section 5.3.2.iii.

3. For flat wall configurations, for benches, and for channels, submit calculations for thickness based on proposed groove spacing, with maximum groove spacing of 24 inches on center each way and minimum groove spacing of 6 inches on center each way.

4. A safety factor of 2.

5. A minimum service life of 50 years under continuous service.
6. A Poisson's ratio of 0.25.
7. An enhancement factor of 7.
8. A groundwater elevation over the base equivalent to surface grade unless otherwise noted on the Drawings.
9. In no case shall cement liners be thinner than 15 mm.

C. The flexural modulus and flexural strength used in the design shall be the values as rated for the specified service life and as submitted in Paragraph 1.7.

D. When cured, the liner shall form a continuous, tight fitting, hard, impermeable liner.

E. The liner shall cover bench and invert and be feathered to meet the inverts and pipe penetrations of all influent and effluent pipes. Field verify all depths and dimensions prior to construction.

F. For fiber reinforced cement lining (monolithic lining), CONTRACTOR may use any of the products specified in the following paragraphs 2.15, 2.16 or 2.17.

2.15 FIBER REINFORCED CEMENT LINING MATERIAL – PORTLAND CEMENT

A. Liner Material – A fiber reinforced cementitious sprayable or cast-in-place material made with Portland cement and used to form a monolithic liner covering all interior manhole surfaces.

B. Manufacturers:
1. QM-1s Restore, Quadex, Inc.;
2. MS-10,000, AP/M Permaform;
3. Raven 755, Raven;
4. Mainstay ML-72 Sprayable Microsilica Cement Mortar, Madewell Products Corporation;
5. Strong-Seal Profile Plus, Strong Seal Systems;
6. Or equal.

2.16 FIBER REINFORCE CEMENT LINING MATERIAL – PORTLAND CEMENT WITH MICROBIAL CONTROL

A. Liner Material – A fiber reinforced cementitious sprayable or cast-in-place material made with Portland cement modified with an antimicrobial additive and used to form a monolithic liner covering all interior manhole surfaces.

B. Antimicrobial additive shall be a liquid formula, registered with the EPA and shall be mixed with the water prior to mixing or the fiber reinforced cementitious material.

1. Proportion antimicrobial additive as recommended by the manufacturer. The amount of antimicrobial additive shall be included in the total water content of the fiber reinforced cementitious material mix design.

C. Product and Manufacturer:

1. Sprayable Microsilica Cement Mortar MS-10,000 with ConShield, AP/M Permaform; or equal.

2.17 FIBER REINFORCE CEMENT LINING MATERIAL – CALCIUM ALUMINATE

A. Liner Material – A fiber reinforced cementitious sprayable or cast-in-place material, made with calcium aluminate cement, used to form a hydrogen sulfide resistant monolithic liner covering all interior manhole surfaces.

B. Product and Manufacturer:

1. Strong Seal MS-2C, Strong Company;
2. Permacast CR-9000, APM;
3. Raven 705CA, Raven;
4. Aluminaliner, Quadex; or equal.

2.18 RESIN-BASED LINERS – GENERAL DESIGN REQUIREMENTS

A. Minimum material properties

1. 50-Year Flexural Strength (ASTM D790, D2990, or DIN EN 761): 2,500 psi.
2. 50-Year Flexural Modulus (ASTM D790, D2990, or DIN EN 761): 200,000 psi, with no greater than a 50% reduction from initial (hour 0.02) strength.
3. Adhesion (ASTM D 7234): 350 psi or substrate failure

B. Thickness: Individual liner thicknesses shall be determined by the CONTRACTOR and submitted per Paragraph 1.7 of this Section. CONTRACTOR may elect to design and install multiple thickness liners for various diameters/configurations/depths within a given structure or install a uniform thickness within a given manhole based on the thickest required portion of the liner. The required minimum liner thicknesses shall be shall be determined using the following:

1. For round configuration, use ASTM F1216, Appendix X1, formulas X1.1 and X1.2. For brick manholes, assume an ovality of 4%, and for precast concrete manholes, assume an ovality of 1% unless otherwise specified or shown.

2. For non-round host structure or circular host structures with greater than 10% ovality, use Type II Design, Section 5.3.2.iii of WRc Sewerage Rehabilitation Manual.
3. For flat wall configurations and for benches and channels, submit calculations for thickness based on proposed groove spacing, with maximum groove spacing of 24 inches on center each way and minimum groove spacing of 6 inches on center each way.
4. A safety factor of 2.
5. A minimum service life of 50 years under continuous service.
6. A Poisson's ratio of 0.3.
7. An enhancement factor of 7.
8. A groundwater elevation over the base equivalent to surface grade unless otherwise noted on the Drawings.
9. In no case shall non-woven, unreinforced liners be thinner than 6 mm. In no case shall fiberglass reinforced liners be thinner than 4.5 mm. In no case shall spray applied liners be less than 200 mils.
10. The long-term flexural modulus and long-term flexural strength used in the design shall be the values as rated for the specified service life and as submitted in Paragraph 1.7. CONTRACTOR may elect to use weaker long-term flexural modulus and long-term flexural strength values than indicated in the submittal for these properties to account for differences in field prepared liners versus laboratory prepared liners, so long as other requirements regarding limits to thickness are not compromised.

C. When cured, the liner shall form a continuous, tight fitting, hard, impermeable liner that is chemically resistant to chemicals found in domestic sewage.

D. The liner shall cover bench and invert, and be feathered to meet the inverts and pipe penetrations of the influent and effluent. Field verify all pertinent dimensions prior to construction.

2.19 RESIN-BASED SPRAY OR TROWEL APPLIED EPOXY LINER MATERIAL

A. Liner material – A sprayable or trowelable resin-based 100% solids, solvent-free ultra-high-build epoxy system used to form a monolithic liner covering all interior manhole surfaces.

B. Liner must have at least 5 years of successful performance in similar applications.

C. Product and Manufacturer:
1. Raven 405, Raven Lining Systems;
2. Cor+Gard, APM;
3. Cor+ROC, APM;

4. Sewerguard HBS 100/MasterProtection 100 CR;
5. 301-14, Warren Environmental System;
6. SEL-80, Parson Environmental;
7. Mainstay DS-5 or DS-6 Ultra High Build Epoxy Coating, Madewell Products Corporation;
8. Strong-Seal Epoxy by Strong Seal Systems;
9. Clad-Liner by Epoxytec; or equal.

PART 3 – EXECUTION

3.1 GENERAL SEQUENCE OF WORK

A. Perform applicable manhole rehabilitation work for a given manhole in the following generalized sequence:

1. Rebuild cone and/or chimney.
2. Reconstruct or build benches and/or inverts.
3. Replace steps.
4. Reset or replace frames and cover.
5. Install end seals (only if hydrophilic end seals installed with CIPPL have failed and approved by Engineer).
6. Injection grout joints and penetrations.
7. Patch all holes, voids, seams, and lift holes. Prepare manhole to receive lining.
8. Install FRCL, wall profilers, or other preparatory coatings required for lining systems.
9. Install other lining systems.

3.2 GENERAL PRODUCT HANDLING, MIXING AND STORAGE REQUIREMENTS

A. Handle, formulate, and store all materials in conformance with the manufacturer's recommendations. The uncured resins, cements, grouts, etc. shall be delivered to the Site in unopened containers, with the date of manufacture clearly indicated.

B. Mix and handle the materials, including their component parts in accordance with manufacturer's recommendations and to minimize hazard to personnel. Provide appropriate protective measures to ensure that the components and the chemicals produced in mixing are under the control of the CONTRACTOR at all times and are not available to unauthorized personnel or others.

3.3 GENERAL MANHOLE PREPARATION AND CLEANING

A. Clear area of brush and trees in the immediate vicinity of the manhole or as directed by the ENGINEER.

B. Place plywood mats or sheeting over the existing flow channel and bench to prevent debris from falling into the sewer prior to any cleaning, demolition, preparation, or rehabilitation work.

C. Install flow through plugs or provide bypass pumping in active manholes where the channel is to be rehabilitated or repaired. Bypass pumping systems shall be in accordance with Section 01 51 41, Temporary Pumping.

D. Maintain commercial and residential sewer service during the manhole rehabilitation process. If necessary to properly complete the Work, the CONTRACTOR may interrupt flow from services if such interruption is first coordinated with and allowed by the OWNER, ENGINEER, and property owner(s). Notification shall be in accordance with Section 01 35 14, Notification Procedures. Upon completion of the work, immediately reinstate all services and notify the property owner(s) that flow from services is again available. The CONTRACTOR assumes all responsibility for notifying property owners of service interruptions. The CONTRACTOR also assumes all responsibility for blockages, back-ups or damages caused to public or private property as a result of the interruption of service flows, whether caused by the CONTRACTOR'S or property owner's actions.

E. Replace steps, where indicated in Contract Drawings. Notify ENGINEER if steps not indicated for replacement are in poor condition or missing and require replacement or installation. Do not replace or install until approved by ENGINEER and OWNER. Clean bench, invert, steps, and interior walls of manholes with clean water to remove deleterious material, dirt, grease, roots, and other debris. Use high-pressure water, at a minimum force of 3,000 psi. If required, use approved cleaners to remove grease, oil, and other matter, which would prevent a good bond between exiting manhole wall and the approved repair materials.

F. If cleaning and preparation cannot be performed as specified in the Contract Documents or as recommended by manufacturer due to the manhole existing condition, notify ENGINEER prior to commencing Work.

G. Active leaks shall be stopped, and all interior surfaces be prepared as recommended by the lining manufacturer.

H. Trim protruding rubber grade rings flush with the chimney.

I. Repair fractures or exposed rebar as described and in accordance with Section 03 01 31, Concrete and Masonry Repair.

J. Plug holes greater than 1-inch in diameter and greater than 1-inch in depth in manhole wall using hydraulic cement as described in this Section.

3.4 REBUILD MANHOLE CONE/CHIMNEY

A. Where shown or specified or as directed by the ENGINEER, rebuild cone and chimney section of manhole. This Work shall be performed concurrent with the replacement or resetting of a frame and cover.

B. Provide a clear vertical opening through frame, grade rings, and chimney that is equal to or greater than the inside diameter of the frame and smoothly transitions from the frame to the barrel or cone of the manhole.

C. Rebuild manhole cone using masonry similar to that removed or provide new precast cone as necessary to rehabilitate manhole.

D. Use grade rings to rebuild chimney section for manholes with a uniform, standard chimney diameter. Bricks shall not be used for grade rings, shims, or other manhole component for grade adjustment.

1. Grade rings shall be limited to 12-inch total combined height.
2. If the total required grade adjustment is 3-inches or less, provide new rubber grade rings for grade adjustment.
3. If the total required grade adjustment is greater than 3-inches, the top grade ring shall be rubber with a minimum thickness of 0.5 inches or as recommended by the grade ring manufacturer. Additional grade rings (if needed) shall be rubber or precast concrete. Select thickness of grade rings in order to minimize the number of grade rings required to achieve proper grade.
4. Total thickness of rubber grade rings shall not exceed 3-inches.
5. Seal each joint between the frame, rubber grade rings, precast grade rings and precast cone using 20 oz. of sealant applied in continuous 1/2 inch beads or single layer of butyl rubber sealant.
6. For precast cones, if utilizing concrete grade rings to rebuild chimney and the surface of existing precast cone is not suitable for attaching concrete grade ring to form a watertight seal using sealant, set concrete grade ring in a layer of uncured mortar. If utilizing only rubber grade rings to rebuild chimney and surface of existing precast cone is not suitable for attaching grade ring to form a watertight seal using sealant, apply a layer of mortar to manhole and allow to cure and then use sealant to attach rubber grade ring.
7. For brick/block cones, seal joint between concrete grade ring and existing competent brick/block by setting concrete grade ring in a layer of uncured mortar. If utilizing only rubber grade rings to rebuild chimney and surface of existing brick/block is not suitable for attaching grade ring to form a watertight seal using sealant, apply a layer of mortar to manhole and allow to cure and then use sealant to attach rubber grade ring.

E. For manholes with irregular chimney sections where standard grade rings are not appropriate for use, rebuild chimney using brick or block.

F. Manhole frames and covers shall be flush with finished roadway.

G. Masonry Work:

1. Brick shall be satisfactorily wet when being laid. Bricks shall be laid flat and radially. Each brick shall be laid in mortar so as to form full bed, end and side joints in one operation. The joints shall not be wider than 1/4-inch at interior face, top, and bottom, and 3 inches on outside end of brick. (19 bricks per 24-inch ring layer). Keep masonry work moist for a period of three days after completion, and take precautions to prevent freezing during cold weather.

2. For concrete block, completely fill the vertical keyways with mortar.

3. Mix and apply mortar according to manufacturer's recommendations.

3.5 RESET/REPLACE FRAME AND COVER

A. In municipal roadways, sawcut pavement around the manhole according to the Details on the Drawings. Sawcut area shall be sufficiently sized to permit removal of pavement, paving subbase, and backfill without undermining undisturbed pavement.

B. In CTDOT roadways, sawcut pavement in accordance with permit obtained by CONTRACTOR, which may require circular cuts.

C. Excavate and dispose of pavement, paving subbase and backfill. Sawcut additional pavement disturbed as a result of excavation activities.

D. Remove existing frame and cover. Remove damaged concrete grade rings. Remove loose or broken brick/block and other loose material down to a competent layer of brick/block. Obtain ENGINEER approval prior to removing all or a portion of the cone section of manhole. Brick and grade rings in good repair may be cleaned and reused, where appropriate.

E. Rebuild damaged manhole cone and chimney in accordance with Section 3.4.

F. If frame and cover are to be replaced, salvage existing frame and cover in accordance with Section 01 11 13, Summary of Work, and provide a new frame and cover. If frame and cover are to be reset, reuse existing frame and cover.

G. Backfill in accordance with the Details on the Drawings. If roadway is damaged beyond the limits of the area to be backfilled, restore damaged roadway.

H. When installing concrete collars in paved areas, pour concrete collar in a single monolithic pour. Collar shall extend below grade rings a minimum of 3-inches and extend above frame flange a minimum of 3-inches. Do not allow vehicle traffic on manhole until concrete and mortar have achieved 2,000 psi compressive strength.

I. When installing concrete collars in unpaved areas, mix concrete for concrete collar according to manufacturer's recommendations. Pour in a single monolithic pour. Restore remaining un-paved areas to pre-construction condition.

3.6 REBUILD MANHOLE BENCHES/INVERTS

A. Remove obstructions and loose materials from benches prior to shaping the invert. Form smooth, U-shaped channels having a minimum depth of one-half pipe diameter and channel it across the floor of the manhole to the effluent pipe outlet. Slope bench to drain away from the manhole wall toward the channel. All benches and channels shall be repaired or replaced using material in kind or with concrete, as appropriate. Provide bypass pumping as required to allow sufficient setting time for material used.

B. Form a smooth transition with radius of 1-inch or greater from channel to manhole bench to eliminate sharp edges on the pipe, bench, or channel. Invert of manhole channel shall match flow line of the influent and effluent pipes.

C. Finish channels smoothly with steel trowel to promote uninhibited flow. Finish new concrete benches that will not be lined with rough broom finish to promote firm footing. Finish new concrete benches that will be lined with wood float.

3.7 MANHOLE STEPS

A. Remove existing manhole steps and replace with new steps in accordance with the manufacturer's recommended procedure. Repair surrounding brick/block/concrete to provide a sound connection between the step and manhole wall.

3.8 CURED-IN-PLACE PIPE MECHANICAL END SEAL INSTALLATION

A. Field measure existing CIPP inside diameter and outside diameter prior to ordering CIPP end seal units.

B. Cut out, remove, and dispose of a portion of the existing CIPP to expose the host pipe. Remove the minimum amount of CIPP necessary to properly install the CIPP end seal.

C. Clean the CIPP and original host pipe so they are free of debris and grease.

D. Install CIPP mechanical end seal units in accordance with the manufacturer's recommended procedure. Position the stainless steel expansion band closest to the manhole so it is located within the outer wall of the manhole or host pipe as appropriate.

E. Remove all debris resulting from the installation of CIPP end seal units.

3.9 CORE DRILLED PIPE PENETRATION MECHANICAL SEAL

A. Inspect manhole wall penetration for spall, rough edges, protruding rebar, and aggregate. Grind rough edges, protruding rebar, and aggregate to a competent surface satisfactory for receiving wall patch. Apply wall patch as defined in this Section to provide a smooth and circular shaped penetration.

B. Center the pipe in manhole wall opening. Make sure the pipe will be adequately supported on both side of the seal so that the weight of the pipe is not supported by the mechanical seal.

C. Size mechanical seal in accordance with manufacturer sizing charts. A soap-based detergent is permitted to aid installation.

D. Install mechanical seal so that all bolt heads are facing the installer.

E. Using a hand socket or offset wrench only, start tightening at 12 o'clock position. Do not tighten any bolt more than four turns at a time. Continue in a clockwise manner until links have been uniformly compressed.

F. Make two or three more passes at four turns per bolt maximum; tighten all bolts clockwise until all sealing elements bulge around all pressure plates.

3.10 INJECTION GROUTING MANHOLE JOINTS, PIPE PENETRATIONS, CHANNELS, AND OTHER DEFECTS

A. Clean manhole in accordance with Paragraph 3.3.

B. Use grout injection method to seal the manhole channel, base, wall joints, penetrating pipe joints, and other defects by injection grouting where shown, specified, or as required to stop leaks prior to application of other products. Modify gel time as appropriate for the conditions present.

C. Minimum insertion points

1. Precast concrete wall joint grouting - Where active leakage is occurring, drill one or more holes at one foot below the leak large enough to accept grout sleeve. Pump grout into the holes until grout comes out of the defect. Where active leakage is not occurring and ENGINEER or Drawings indicate the joint should be sealed, drill holes at 4, 8, and 12 o'clock positions one foot above the joint to be sealed and drill holes with grout sleeves inserted into the walls at 2, 6, and 10 o'clock positions one foot below the joint to be sealed. Pump grout into the lower holes until grout comes out of the upper holes.
2. Brick wall grouting – Where active leakage is occurring, drill hole into lowest leaking point sufficient to accept grout sleeve. Pump grout into the hole until

grout seals defect and until grout no longer flows through brick wall at any other point.

3. Grout invert, base, and/or bench grouting - Drill one or more holes on lower side of the defect/leak. Pump grout into the grout sleeves until grout comes out of the defect.

4. Penetrating pipe joint grouting - Drill one hole through manhole wall/base at the spring line or top of manhole bench, whichever is lower, on each side of the pipe penetration, and one hole at the 12 o'clock position 2 inches over the crown of the pipe. Pump grout into lower drill holes until grout come out of the crown drill hole.

5. Other manhole wall defect grouting - Perform injection grouting in a manner appropriate to seal the defect watertight. Includes work related to injection grout at steps, lifting holes, etc.

D. Pump grout at controlled pressures that are in excess of groundwater pressures. Install additional holes and grout as necessary, for varying type and size of leaks encountered, types of soil, and types of voids being filled.

E. Leaks that are determined to be too large to be effectively eliminated by the grout injection method, shall be plugged with hydraulic cement prior to initiating the injection of grout.

F. Allow grout to cure overnight, after which each grouting site shall be inspected. If leaks are observed, drill new hole(s) and apply more grout as necessary to stop the leak. Repeat the process as necessary to stop the leaks.

G. Repair all holes created by the grouting process with hydraulic cement.

H. When grouting prior to lining or coating the structure, remove 1/2-inch deep of chemical grout from the grout hole and fill hole created by the grouting process with non-shrink cement grout.

3.11 GENERAL LINING PREPARATION

A. Remove sufficient channel material to allow application of liner of sufficient thickness and retain a smooth and even sloped flow line from the influent pipes to the effluent pipe(s).

B. Clean and prepare manhole in accordance with Paragraph 3.3. Remove loose and protruding brick, mortar and concrete. Roughen surfaces to meet substrate requirements for materials to be adhered.

C. Repair any fractures or exposed rebar in concrete or masonry as described and in accordance with Section 03 01 31, Concrete and Masonry Repair.

D. Pack annular spaces between the manhole cone or chimney and the bottom of the manhole frame with hydraulic cement. Fill voids or gaps in the manhole chimney, cone, or barrel with hydraulic cement or wall patch. Do not apply hydraulic cement as surface coating.

E. Stop leakage from pipe penetrations, wall defects, joints or other features or defects using chemical grout injection in accordance with Paragraph 3.10 and to the extent required by the individual lining material requirements. Hydraulic cements or water stops may not be used except in defects allowing packing (>3/4-inch diameter); do not apply hydraulic cement as surface coating to stop leakage.

F. Pressure Cleaning – Prepare all surfaces to be lined so that underlying masonry and concrete are structurally sound, free of poorly bonded material, and free of coatings or chemically degraded surfaces (gypsum or salts) that reduce adhesion of the liner. At a minimum, use 5,000 psi water with spinning head or other suitable nozzle that applies the water stream at an oblique angle that allows cleaning and abrading of the concrete and masonry surfaces sufficient to remove all chemically compromised concrete/mortar without fracturing or damaging the concrete/masonry. If cleaning cannot be performed as specified due to the manhole existing condition, notify ENGINEER. Detergent and/or hot water cleaning may be required to remove grease completely from the surfaces. Sand blasting may also be used to prepare and profile the substrate surface. Install containment system for sand/beads if blasting.

G. Lattice Removal – If necessary, spray apply a pH 4-5 muriatic acid solution onto the surfaces to be lined at a rate of 1 gallon of solution for every 15 square feet of surface to remove residual surface salts, or as recommended by manufacturer of lining system. Leave solution on surfaces for 1 minute, then rinse with clean water to return surface to a neutral pH. Test surfaces with litmus paper at a rate of one test every 30 square feet. If pH at any location is lower than 8.5, re-rinse entire surface and repeat pH testing. If the entire manhole surface, including the channel, bench, and chimney, was sand-blasted, then lattice removal may not be necessary.

H. Disinfection - If necessary, spray apply a 2% chlorine bleach solution (typically a 1 part bleach: 5 parts water) onto the surfaces to be lined at a minimum rate of 1 gallon of solution for every 10 square feet of surface to diminish bacteria residing on the surface, or as recommended by manufacturer of lining system. Leave solution on surfaces for at least 5 minutes, then rinse with clean water at a minimum rate of 3 gallons for every 10 square feet of surface area. If the entire manhole surface, including the channel, bench, and chimney, was sand-blasted, then disinfection may not be necessary.

I. Primer – Prime substrate with manufacturer recommended primer prior to lining.

J. Where appropriate, prepare manhole steps at manhole wall penetration to promote liner adhesion and watertightness at the step/wall interface. Clean and prepare frame to promote liner adhesion.

3.12 FIBER REINFORCED CEMENT LINING AND WALL PROFILING MORTARS

A. Preparation

1. No infiltration leaks greater than PACP Weepers may be evident in the manhole prior to performing FRCL lining. Weep holes may be drilled into walls just above the bench to allow a pre-coat of FRCL to be applied to the wall above the weep holes; weep holes shall be grouted closed and the specified thickness of FRCL (over and above the pre-coat thickness) applied. Select water control method as appropriate.
2. Prepare concrete manholes such that concrete wall has a ICRI CSP #5 profile or as recommended by lining manufacturer.
3. Prime substrate with manufacturer recommended primer prior to lining.
4. Thoroughly moisten all surfaces with clean water just prior to the application of the lining materials. Do not apply lining in an area where running water exists.
5. If using anti-microbial agent in the FRCL, the amount to be used shall be as recommended by the manufacturer of the antibacterial additive. This amount shall be included in the total water content of the design mix. Other additives shall be added into the mix water to ensure even distribution of the additive throughout the mix.
6. Clean FRCL mixing and pumping equipment, hoses, and nozzles at regular intervals, and at least daily, to remove any hardened materials. Each batch of material should be entirely discharged before recharging with fresh material. Add water, fibers, and additives to the mixer in accordance with the manufacturer's recommendations. Thoroughly mix all lining materials to ensure all agglomerated particles are reduced to original size or removed prior to placement into the application equipment (i.e. the hopper). Re-mixing or tempering shall not be permitted. Do not mix in any rebound materials.

B. Application

1. Do not apply liner when air or substrate temperature within the manhole is expected to fall below 40° F within 72 hours of placement. Ambient and substrate temperature must be at least 45° F at the time of placement.
2. Do not apply liner when ambient or substrate temperature exceeds 95° F.
3. Ensure the operating air pressure is uniform and provides adequate nozzle velocity for proper compaction. Hand application and compaction will not be permitted.
4. Continuously regulate the water content and hold the installation equipment nozzle at the proper distance away from and as nearly perpendicular to the

prepared sub-surface as the working conditions will permit so that the applied materials consistently achieve proper compaction with a low percentage of rebound and no visible material sagging.

5. Follow a sequence routine that fills corners, corbels, and overhangs with adequately compacted materials.
6. Immediately remove slough pockets and install replacement material while concrete is still green (i.e., plastic, set but not hardened).
7. Bring the installed materials to required thicknesses.
8. Suspend application if (a) air velocity separates the cement from the aggregate at the nozzle or (b) ambient temperature exceeds requirements.
9. Allow a sufficient time interval between successive layers of material application to allow "tackiness" to develop but not set final.
10. For calcium aluminate lining, always apply in two coats of approximately equal thickness, and apply the second coat when the first coat is green, approximately 15 to 30 minutes after completion of the application of the first coat depending on field conditions. Total thickness of two coats may be greater than design thickness to accommodate minimum coat thickness requirement of FRCL manufacturer.
11. Line all surfaces from channel invert up to the bottom of the manhole frame with liner. Provide a smooth tapered finish in flow channel to the influent and effluent pipes. Remove excess material from manhole frame, bench, and channel prior to the hardening of each coat. Do not apply liner material to manhole steps.
12. Finish walls with brush, broom, or trowel. Finish channel with steel trowel. Finish bench with stiff brush or broom.
13. Cure liner in accordance with manufacturer recommendations.
14. Any repairs to defective liners must be applied either to original substrate or to roughened and primed new concrete. All repairs shall be compacted to pressures equal to original sprayed pressures. No veneering or skim coats less than 10 mm will be permitted. Each repaired area shall be subject to an adhesion test.

C. Testing

1. Thickness: Verify the minimum FRCL thickness of the manhole liner in the presence of the ENGINEER before material has set up and between each layer. During application, measure thickness using a wet film thickness gauge meeting the requirements of ASTM D4414. Measure thickness of liner once for every 25 square feet on walls; every 6 linear feet at all inside corners, outside corners, and bench-wall interface; every 12 square feet of overhang/roof. Repair all verification points using a manufacturer-approved material and method upon acceptance of the thickness tests. Submit all thickness readings in writing to the ENGINEER.

2. All FRCL manholes shall be free of visible leakage. No payment shall be made for any manhole with visible leakage.

3. Material performance testing sample preparation: At the first structure lined, and for every 20 manholes/structures lined thereafter, prepare one 18-inch x 18-inch FRCL sample at the design thickness specified using a sheet of burnished aluminum, clean smooth steel, or stainless steel laid flat using the same field equipment used to apply liner. Cure the sample under similar field conditions as dictated by the FRCL lining work. Cut the sample into four 8-inch x 8-inch tiles. Label samples with the contract number, date of installation, CONTRACTOR name, material, street location, manhole number, and specified thickness. Send one sample to independent third-party laboratory for testing and deliver one sample to ENGINEER. Secure the third sample on the top step of the manhole. CONTRACTOR may retain the fourth sample or dispose of it at his discretion. In waterproof, indelible ink, label the sample in the manhole with "Do not remove before (specify date)". The date specified shall be two years after the date of liner installation unless otherwise directed be the ENGINEER. If more than one sample is collected and tested over the course of the Work, the average of the sample results will be considered representative of all the liners installed for that particular resin-fabric combination.

4. Material Testing: The following tests at the following minimum frequencies will be performed by the CONTRACTOR on liners sampled. The CONTRACTOR may, at his discretion and cost, conduct additional testing to improve the resolution of performance test characterization. All testing shall be performed by an independent, accredited ISO 17025 testing facility with an American Association for Laboratory Accreditation (A2LA) for the specific test to be performed.

   a. Short-term Flexural (Bending) Properties – The initial tangent flexural modulus of elasticity and flexural yield strength measured in accordance with ASTM C293.

      i. Frequency – 1 test per sample (minimum of 2)

   b. Flexural Modulus of Elasticity measured in accordance with ASTM C469.

      i. Frequency – 1 test per sample (minimum of 2).

3.13 RESIN-BASED SPRAY OR TROWEL APPLIED EPOXY LININGS

A. Preparation

1. When approved for use by the lining manufacturer, factory blended, rapid setting, high early strength, fiber reinforced, non-shrink profiling mortars may be troweled or pneumatically spray applied if specifically formulated to be suitable for topcoating with the specified lining product and allowed sufficient time to off-gas before topcoating.

2. New Portland cement concrete structures shall have cured a minimum of 30 days prior to application.
3. Prepare concrete or profile layer to have ICRI CSP #4 profile or rougher, or as recommended by manufacturer.
4. Prime substrate with manufacturer recommended primer prior to lining.

B. Application

1. Do not apply liner when air or substrate temperature within the manhole is expected to fall below 40° F within 72 hours of placement. Ambient air and substrate temperature must be at least 45° F at the time of placement.
2. Do not apply liner when ambient air or substrate temperature exceeds 95° F.
3. Follow manufacturer recommendations for safe application of material.
4. Hold the installation equipment nozzle at the proper distance away from and as nearly perpendicular to the prepared sub-surface as the working conditions will permit to secure maximum material compaction with minimum rebound and no visible “sag”.
5. Follow a sequence routine that fills corners, corbels, and overhangs with adequately compacted materials.
6. Immediately remove slough pockets and install replacement material.
7. Bring the installed materials to required thicknesses.
8. Line all surfaces from channel invert up to a minimum of two inches onto the manhole frame with liner. Provide a smooth tapered finish in flow channel to the influent and effluent pipes.
9. Sprinkle small amount of sand onto bench before final hardening to promote traction.
10. Cure liner in accordance with manufacturer recommendations. If a second layer of liner is required for any reason, follow manufacturer instructions for preparation of the liner surface to accept the additional liner material.
11. Do not apply liner material to manhole steps.
12. Do not allow wastewater to come in contact with the liner material until the liner has been tack-free and cool to the touch for at least 30 minutes.

C. Testing

1. All lined manholes shall be free of visible leakage.
2. Thickness: Verify the minimum liner thickness of the manhole liner in the presence of the ENGINEER before material has set up and between each layer. During application, measure thickness using a wet film thickness gauge meeting the requirements of ASTM D4414. Measure thickness of liner once for every 25 square feet on walls; every 6 linear feet at all inside corners, outside corners, and bench-wall interface; every 12 square feet of

overhang/roof. Repair all verification points using a manufacturer-approved material and method upon acceptance of the thickness tests. Submit all thickness readings in writing to the ENGINEER.

3. Holiday testing: After completing all other work to the manhole and allowing sufficient time to allow complete cure of all materials, test in the presence of the ENGINEER all resin-based spray and trowel applied lined manholes for leakage using high voltage holidays (voids) detection equipment. All holiday testing shall be in accordance with the lining system manufacturer's recommendations. General testing voltage is provided below for guidance only. CONTRACTOR shall verify the lining system manufacturer's recommended holiday testing voltage prior to commencing testing.

   a. For 125 mils, test at 14,000 volts.

   b. For 250 mils, test at 20,000 volt.

   c. For 400 mils, test at 25,000 volts.

   d. For all other thicknesses, the test voltage shall be determined using the following formula: Voltage = 1250 x (Mils)^0.5.

   All detected holidays shall be marked and repaired in accordance with lining system manufacturer's repair instructions.

4. Material performance testing sample preparation: At the first structure lined, and for every 20 manholes/structures lined thereafter, prepare four 12-inch x 12-inch liner samples at the design thickness specified using a sheet of burnished aluminum, clean smooth steel, or stainless steel laid flat using the same field equipment used to apply liner. Cure the sample under similar field conditions as dictated by the lining work. Label samples with the contract number, date of installation, CONTRACTOR name, material, street location, manhole number, and specified thickness. Send one sample to independent third-party laboratory for testing and deliver one sample to ENGINEER. Secure the third sample on the top step of the manhole. CONTRACTOR may retain the fourth sample or dispose of it at his discretion. In waterproof, indelible ink, label the sample in the manhole with "Do not remove before (specify date)". The date specified shall be two years after the date of liner installation unless otherwise directed be the ENGINEER. If more than one sample is collected and tested over the course of the Work, the average of the sample results will be considered representative of all the liners installed for that particular resin-fabric combination.

5. Material Testing: The following tests at the following minimum frequencies will be performed by the OWNER/CONTRACTOR on liners sampled. The CONTRACTOR or OWNER may, at his discretion and cost, conduct additional testing to improve the resolution of performance test characterization. All testing shall be performed by an independent, accredited ISO 17025 testing facility with an American Association for Laboratory Accreditation (A2LA) for the specific test to be performed.

a. Short-term Flexural (Bending) Properties – The initial tangent flexural modulus of elasticity and flexural yield strength measured in accordance with ASTM D 790.

    i. Frequency – 1 test per sample (minimum of 2).

b. Flexural Modulus of Elasticity measured in accordance with ASTM C790.

    i. Frequency – 1 test per sample(minimum of 2).

c. Chemical Resistance - The chemical resistivity measured in accordance with ASTM F1216, Appendix X2.

    i. Frequency – 1 test per sample(minimum of 2).

3.14 INSPECTION AND REPAIR

A. After manhole rehabilitation has been completed, visually inspect the manhole in the presence of ENGINEER. Check for cleanliness, soundness of repairs, and for elimination of leakage. Repair all defects not accepted by the ENGINEER for reduced payment.

B. Notify the property owner(s) that flow from services is again available in accordance with Section 01 35 14, Notification Procedures. The CONTRACTOR assumes all responsibility for notifying property owners of service interruptions.

C. If return to service duration is longer than indicated on notices, then CONTRACTOR shall knock on doors of all affected properties to notify owner or tenant of the new anticipated return to service time.

3.15 CLEANUP

A. Remove all debris from the manhole.

B. If debris from CONTRACTOR'S work has entered the sewer pipe, clean the affected pipe(s) to the satisfaction of the ENGINEER and at no additional cost to the OWNER.

3.16 WARRANTY INSPECTION

A. Visually re-inspect all manholes repaired or rehabilitated in accordance with this Section in the presence of the ENGINEER 18 to 24 months after Conditional Acceptance of the Work during high groundwater conditions. The ENGINEER shall select the time for the Warranty Inspection and will give the CONTRACTOR two to eight weeks notice prior to such inspection.

B. Make repairs necessary to eliminate or repair any defect at no additional cost to the OWNER.

C. All repair techniques and methods shall be approved by the ENGINEER prior to the initiation of any repair activities.

D. Any manholes requiring repair under this Warranty Inspection are to be re-inspected again 18 to 24 months after repairs and again repaired if necessary. This shall repeat until no defects are found.

E. For work that did not meet specification and a negotiated reduction in price was agreed upon by the CONTRACTOR and the OWNER prior to conditional acceptance this out-of-specification condition becomes the basis upon which future corrective actions during the six-month retained percentage period and warranty period is based. Only defects beyond those in place at the time of the negotiated price reduction will be considered the CONTRACTOR's responsibility during these periods.

F. If additional defects are discovered prior to the end of the warranty period, the OWNER will request the CONTRACTOR to correct these additional defects or request an additional price reduction. If, in correcting these defects, the CONTRACTOR corrects the previous defects (for which the negotiated reduction was incurred), the OWNER shall pay the CONTRACTOR the difference between the originally negotiated reduced value of the Work and the new, improved/corrected value of the Work, the value of which will be solely determined by the ENGINEER. No payment over 100% of the bid price of the Work will be made.

G. The OWNER continues to retain the right to either demand that corrective action to address the additional defects be completed or to offer the CONTRACTOR a further negotiated reduction in the value of the Work. The CONTRACTOR continues to retain the right to correct the defective work at any point during the warranty period and receive full payment for the Work, or to negotiate a reduced payment for the Work. The acceptability of all repairs and the finished value of Work after said repairs continue to be solely the ENGINEER's determination.

+ + END OF SECTION + +

SECTION 33 31 71

SANITARY SEWER SERVICE RECONNECTIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope: The CONTRACTOR shall furnish and operate all necessary materials and equipment for the reconnection of sewer services by remote method.

B. Related Work Specified Elsewhere:
   1. Section 01 51 41, Temporary Pumping
   2. Section 33 01 30.16, Television Inspection of Sewers
   3. Section 33 01 30.61, Packer Injection Grouting
   4. Section 33 01 30.65, Pressure Testing of Sewer Pipe Joints & Tap Connections
   5. Section 33 01 30.72, Cured-In-Place Pipe Lining – Steam Cured
   6. Section 33 01 30.73, Cured-In-Place Pipe Lining – UC Cured
   7. Section 33 01 30.74, Cured-In-Place Lateral Lining

1.2 SUBMITTALS

A. Submittals shall conform to the requirements of Section 01 33 00, Submittal Procedures.

B. Submit the following to ENGINEER for review. Notice to customers whose sewer service have been interrupted and are now reinstated.

PART 2- PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PERFORMANCE REQUIREMENTS

A. Accurately field locate service connections, whether in service or not, along the rehabilitated sewer main. For new parallel and replacement sewers, service connections may be located as pipe laying progresses from downstream to upstream.

B. Properly disconnect existing connections from the existing sewer and reconnect to the rehabilitated liner, as described in this Section.

C. Reconnect service connections, including those that go to unoccupied or abandoned buildings, unless directed by ENGINEER. Do not reconnect capped connections or locations where structure has been demolished, unless directed otherwise by ENGINEER.

D. Begin reconnection of service lines within 24 hours after cured-in-place liner.

E. The reinstated lateral opening shall be neat, smooth, and without any hanging fibers. The invert of the service connection shall match the invert of the reinstated service opening. Additionally, the service opening shall be reinstated to between 95 percent minimum and 100 percent maximum of the original service connection opening, and the opening's edge shall be smooth and free of loose or abrasive material.

3.2 PREPARATION

A. Determine the exact location and number of service connections, both in and out of service, from television inspection tapes or from field survey. Use existing service locations to reconnect service lines to new liner or sewer main.

B. For rehabilitated sewer mains, allow liner to normalize to ambient temperature and recover from imposed stretch. For cured-in-place liners, verify that liner is completely cured.

3.3 RECONNECTION BY REMOTE METHOD

A. Service reconnections made by the remote method shall be made using remote operated cutting tools.

B. The method and equipment used shall restore the service connection capacity to not less than 95 percent of original capacity.

C. Service reconnection shall be smooth and free of loose or abrasive material.

D. The CONTRACTOR shall immediately open any missed connections and repair any holes drilled in error, by a method approved by ENGINEER.

E. Faulty cuts shall be repaired at no additional cost to the OWNER.

3.4 TESTING

A. Lateral service connections reconnected by remote method shall be TV inspected and videotaped as specified in the corresponding lining specification. Lateral service connections reconnected or rehabilitated by excavation method shall be TV inspected during high ground water conditions (i.e., spring, fall) as approved by the ENGINEER. All television inspections shall comply with Section 33 01 30.16, Television Inspection of Sewers.

3.5 CLEANUP

A. Upon completion of installation work and testing, clean and restore project area affected by the work to a condition at least equal to that which existed prior to the start of the work.

++ END OF SECTION ++