

TOWN OF BROOKFIELD, CONNECTICUT

WATER POLLUTION CONTROL AUTHORITY

AUTHORITY MEMBERS

NELSON MALWITZ
Chairman

LOUISE TROJANOWSKI-MARCONI
Vice Chairperson

MATHEW BROWN
Commissioner

LORETTA DONOVAN
Commissioner

JAMES MURRAY
Commissioner

MICHAEL DEL VALLE
Alternate

* * * * *

ROGER PRINZ
Maintenance Manager

JOHN SICLARI
Director

JEFFREY B. SIENKIEWICZ, ESQ.
Commission Attorney

KRISTI MCPADDEN
Executive Administrator

CONTRACT 2022-01

Brookfield Market Sewer Main Extension

Langan Job No. 190011055

W. Charles Utschig, P.E.
License No. P.E.N. 19262
Langan, CT, Inc.
White Plains, NY

Date: November 11, 2022

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ADVERTISEMENT FOR BIDS

ADVERTISEMENT FOR BIDS
TOWN OF BROOKFIELD, CT
WATER POLLUTION CONTROL AUTHORITY

CONTRACT 2022-01

Brookfield Market Sewer Main Extension

Notice is hereby given that sealed bids will be received, publicly opened and announced by the Brookfield Water Pollution Control Authority (Authority), on January 5, 2023 at 2:00 PM local time.

The work covered under this contract includes the installation of 5 sanitary pump stations, sewer force main, 8-inch diameter gravity sewer with 4 manholes, sanitary sewer service laterals, associated appurtenances, and site restoration as required in the Contract Documents.

Contract documents may be examined and downloaded at the Brookfield Water Pollution Control Authority Portal <https://brookfieldwpca.org/bids> starting November 21, 2022.

A pre-bid meeting will be held at 10:00 am on December 14, 2022 at the Authority office, 53A Commerce Rd, Unit 1, Brookfield, CT. The meeting is not mandatory, but prospective bidders are urged to attend.

Bids must be submitted on standard proposal forms in the manner designated therein and be enclosed in a sealed envelope bearing the name and address of the bidder on the outside, addressed to the Brookfield Water Pollution Control Authority. The words "Brookfield Marketplace Sewer Main Extension, Contract 2022-01" must be printed on the face of the envelope.

Sealed bids will be received by the Authority at the Brookfield Water Pollution Control Authority, Brookfield Municipal Center, 53A Commerce Road, Unit 1, Brookfield, CT. prior to the date and time established for opening of bids. **No bids will be received by mail.**

Each individual Bid Proposal must be accompanied by a bid security in the amount of five percent (5%) of the bid, a certificate guaranteeing the furnishing of Performance and Payment Bonds (Consent of Surety), and all other documents identified in the Form of Proposal. Bid security may be in the form of a bid bond, cashier's check, or certified check. The successful bidder must furnish a Performance Bond and a Payment Bond, each in the full amount of the contract price, issued by a surety company licensed to issue such bonds in the State of Connecticut, and having an A.M. Best & Co. rating of at least A-minus.

No bidder may withdraw his bid within 120 days after the date of the opening thereof. The Authority reserves the right to waive any informality in the bids, to reject any or all bids, and to make its awards in the best interests of the Town of Brookfield, CT.

Attention is called to the State requirements regarding employment, nondiscrimination, safety and wage scales.

Attention is called to provisions in the Contract Documents providing for preference to local laborers and subcontractors.

This contract is subject to state set-aside and contract compliance requirements.

Brookfield Water Pollution Control Authority
By: Nelson Malwitz, Chairman

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WATER POLLUTION CONTROL AUTHORITY

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Brookfield Water Pollution Control Authority
By: Nelson Malwitz, Chairman

INFORMATION FOR BIDDERS

INFORMATION FOR BIDDERS

1. **RECEIPT AND OPENING OF BIDS** - The Brookfield Water Pollution Control Authority (hereafter called the "Authority" or the "Owner") will receive sealed bids for "Brookfield Market Sewer Main Extension, Contract 2022-01" at the office of the Brookfield Water Pollution Control Authority, Brookfield Municipal Center, 53A Commerce Road, Unit1, Brookfield, CT. until 2:00 PM local time on January 5, 2023 at which time they will be opened and announced.

Proposals shall be enclosed in opaque sealed envelopes plainly marked "Brookfield Market Sewer Main Extension, Contract 2022-01", with the name and address of the bidder.

No bids will be received by mail.

2. **CONTRACT DOCUMENTS** - Contract Documents will be obtained from the Brookfield Water Pollution Control Portal. Refer to the Advertisement to Bid for the information to access the Portal. If you the contractor has any questions to access the Portal, please call (203)-775-7319 x 1000.

3. **DESCRIPTION OF WORK** - The work covered under this contract includes the installation of sanitary pump stations, sewer force mains, 8-inch diameter gravity sewer with 4 manholes, sanitary sewer service laterals, associated appurtenances, associated appurtenances, and site restoration as required in the Contract Documents.

4. **ADDENDA AND INTERPRETATIONS** - No interpretations of the meaning of the Contract Documents will be made to any prospective bidder orally. Every request for such interpretation should be in writing addressed to Langan CT, Inc., 1 North Broadway – Suite 910, White Plains, New York 10601, or via email to cutschig@langan.com, and to be given consideration must be received on or before the end of the business day on December 9, 2022 via email or regular mail. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the Contract Documents which will be emailed with return receipt to all prospective bidders (at the respective email address furnished for such purposes) not later than the end of the business day on December 16, 2022. Failure of any bidder to receive any such addenda or interpretations shall not relieve said bidder from any obligations under his bid as submitted. All addenda so issued shall become part of the Contract Documents.

5. **OBLIGATION OF BIDDER** - Each bidder must inform himself fully of the conditions relating to the construction and the labor provisions under which the work will be performed; failure to do so will not relieve a successful bidder of his obligation to furnish all material and labor necessary to carry out the provisions of the Contract Documents and to complete the contemplated work for the consideration set forth in his bid.

At the time of the opening of bids each bidder will be presumed to have inspected the sites and to have read and to be thoroughly familiar with the Contract Documents (including all addenda). The failure or omission of any bidder to receive or examine any form, instrument, or document shall in no way relieve any bidder from any obligation in respect to his bid.

Bidders are notified that it is obligatory upon them to obtain by their own means information which they may require as to the existing physical condition, and in particular as to subsurface and ground water conditions. The Owner will make available to the bidder all information obtained by investigations prior to the bid openings, but makes no guarantee with respect to the accuracy of such information, and each bidder in bidding represents that he relies exclusively upon his own investigations, and he makes his bid with a full knowledge of all conditions, and the kinds, quality, and quantity of work required.

6. SUBSURFACE UTILITIES - The approximate locations of certain existing subsurface pipes and structures are indicated on the drawings. The Owner does not guarantee that the locations and/or depths of such utilities are even approximately correct. Contractor must contact "Call Before You Dig" 1-800-922-4455, or 203-281-5435. In addition, the contractor is obligated to retain the services of a qualified utility locator company to have all existing utilities located on the project site prior to the start of any work. This effort is critically important for this project and any existing utility information that affects the design of this project must be reported to the BWPCA prior to the start of construction and prior to the ordering of any materials. Refer to item 16 of "Information for Bidders."

7. INFORMATION NOT GUARANTEED - All information given on the drawings, or in the Contract Documents, relative to materials encountered, subsurface conditions, and existing pipes and structures is from the best sources at present available to the Owner. All such information and the drawings of existing construction are furnished only for the convenience of bidders.

It is understood and agreed that the Owner does not warrant or guarantee that the materials, conditions, and pipes or other structures encountered during construction will be the same as those indicated by the information given on the drawings. The bidder must satisfy himself regarding the character, quantities, and conditions of the various materials and the work to be done.

It is understood and agreed that the bidder or the Contractor will not use any of the information made available to him, or obtained in any examination made by him, in any manner as a basis or ground for claim or demand of any nature against the Owner or the Engineer, arising from or by reason of any variance which may exist between the information offered and the actual materials or structures encountered during the construction work.

8. PREPARATION OF PROPOSAL - Proposals must be submitted on the prescribed form. All blank spaces for unit prices, extended totals, and summations must be filled in, in ink or typewritten, in both words and figures. The bidder must sign the bid, and give his title and business address. All forms attached to the Proposal shall be completed by the bidder and submitted with the bid as well as any other documentation requested by these bid documents and required by law.

9. ERRORS IN BID - In the event there is a discrepancy between the unit prices (if any) and the extended totals, the unit price shall govern. In the event there is a discrepancy between prices written in words and written in figures, the prices written in words shall govern. In case of error in the bidder's extended summation, the computed total of the Engineer shall govern. If an error

in any bid item is obvious, and is corroborated by extensions or additions, the Owner may make the appropriate correction and accept the bid.

10. **APPROXIMATE QUANTITIES** - The quantities given in the Proposal are approximate only, being given as a basis for the uniform comparison of bids, and the Owner does not expressly or by implication agree that the actual amount of work will correspond therewith.

11. **BIDDERS TO CHECK APPROXIMATE QUANTITIES** - Bidders must satisfy themselves by personal examination of the location of the proposed work, and by such other means as they may choose, as to the actual conditions and requirements of the work, and the accuracy of the estimate of the Engineer, and shall not, at any time after the submission of a bid, dispute or complain of such statement or estimate of the Engineer, nor assert that there has been any misunderstanding in regard to the nature or amount of the work to be done.

12. **PRICES NOT CHANGED BY CHANGE OF QUANTITIES** - An increase or decrease in the quantities listed in the Proposal for any item shall not be regarded as sufficient grounds for an increase or decrease in the unit price of that item, nor in the time allowed for the completion of the work, except as provided in the Contract. The Owner reserves the right to delete portions of the work, or to add to the work, as it deems necessary, and such changes shall be based upon the unit prices bid or upon reasonable prices established by the Engineer.

13. **INFORMAL BIDS** - The Owner may reject as informal, bids, which are incomplete, conditional, or obscure, or which contain additions not called for, erasures not properly initialed, alterations or irregularities of any kind, or the Owner may waive such informalities.

14. **INTENT OF CONTRACT DOCUMENTS** - The intent of the Contract Documents is to obtain a complete job, satisfactory to the Owner and the Engineer. It shall be understood that the bidder is cognizant of the full requirements of the Contract, and has based his Proposal upon such understanding. Compensation for all work and materials required to complete the Contract shall be considered included in the price bid in the Proposal.

15. **RIGHT TO ACCEPT OR REJECT BIDS** - The Owner reserves the right to select the lowest responsive and responsible bid, to waive any informalities in the bids, to reject any or all bids, and to make its awards in the best interests of the Town of Brookfield. Conditional bids may be rejected.

16. **LOCATING UTILITIES** - The Contractor shall obtain advance information on the vertical and horizontal location of all utilities, structures, or other facilities located within the project area. Such information shall be obtained from utility mark-outs, test pits, or pipe locating devices, and the obtaining of such information is exclusively the Contractor's responsibility. Any conflicts must be reported to the Engineer sufficiently in advance of the work schedule to avoid delays or extra work. The cost of obtaining such advance information shall be included in the prices bid for the various items of work.

17. **BID SECURITY** - Each bid must be accompanied by a cashier's check, a certified check of the bidder or a bid bond issued by a surety company licensed to issue such bonds in the State of Connecticut in the amount of five percent (5%) of the amount of the bid, drawn to the benefit of

the Brookfield Water Pollution Control Authority. Such checks will be returned to all except the three lowest responsive bidders within three days after the opening of bids. The remaining checks will be returned to the three lowest bidders within 48 hours after the Owner and the accepted bidder have executed the Contract, or if no Contract has been so executed, within 120 days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his bid. Bid bonds will not be returned, except on written request.

18. CONSENT OF SURETY/SURETY GUARANTEE - In addition to the checks or bid bonds for bid security, each bid must be accompanied by a guaranty from a surety company, qualified and authorized to do business in this State, and having an A.M. Best & Co. rating of at least A-minus, agreeing to furnish Performance and Payment Bonds, each in the full amount of the contract price in the event of award of Contract.

19. QUALIFICATION OF BIDDER - The Owner may make such investigations as are deemed necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of such bidder, fails to satisfy the Owner that such bidder is properly qualified and/or financially capable to carry out the obligations of the contract and to complete the work contemplated therein within the time limit stipulated.

20. WITHDRAWAL OF BIDS - Upon proper request and identification, a bidder may withdraw his bid prior to the scheduled time for the opening thereof. However, no bid may be withdrawn after the first bid has been opened and thereafter not for a period of 120 days after the date of the opening thereof.

21. LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT - The successful bidder, upon his failure or refusal to execute and deliver the Contract and the required Performance and Payment Bonds within twenty (20) days after he has received notice of the acceptance of his bid, shall forfeit to the Owner as liquidated damages for such failure or refusal, the security deposited with his bid.

22. CONTRACT BONDS AND INSURANCE - Simultaneously with his delivery of the executed Contract, the successful bidder must deliver to the Owner Performance and Payment (labor and materials) bonds, each in the amount of one hundred percent (100%) of the accepted bid, as security for the faithful performance of his Contract, and for the payment of all persons performing labor or furnishing materials in connection therewith; prepared in a form acceptable to the Owner (see forms attached) and having as security thereon such surety company or companies as are acceptable to the Owner and as are authorized to transact business in this State, and having an A.M. Best & Co. rating of at least A-minus. The bonds shall comply with Section 49-41 et seq. of the Connecticut General Statutes.

Simultaneously with the delivery of the executed contract, the successful bidder must deliver approvable insurance certifications, as specified in Article 8 of the General Conditions.

The Contractor shall obtain and pay for, and shall provide proof of insurance for the types and limits of insurance as more particularly specified in Article 8 for the General Conditions.

23. EXECUTION OF CONTRACT - The bidder to whom the contract is awarded will be required to furnish the Contract Bonds duly executed by a satisfactory surety (as defined above), and to execute the contract within the time limit stated in the Proposal after notification that the contract is ready for signature.

24. POWER OF ATTORNEY - Attorneys-in-fact who sign Contract Bonds must file with each bond a certified and effectively dated copy of their power of attorney.

25. TIME FOR COMPLETION AND LIQUIDATED DAMAGES - The bidder to whom the contract is awarded must agree to commence work within 20 days from the date of receipt of written notice to proceed from the Owner, and shall complete the work in all respects except for maintenance and placement of permanent pavement within 270 consecutive calendar days following the service of said notice. Liquidated damages for late completion shall be as stipulated in the Contract.

26. LAWS AND REGULATIONS - This contract will be governed by the laws of the State of Connecticut. The attention of the bidder is specifically directed to the provisions of the General Conditions relative to laws and ordinances, State Labor Standards, Non-discrimination Provisions and Safety Provisions.

This contract will be funded in part by a State of Connecticut STEAP Grant in the amount of up to \$500,000.00.

The contractor who is selected to perform this State project must comply with CONN. GEN. STAT. §§ 4a-60, 4a-60a, 4a-60g, and 46a-68b through 46a-68f, inclusive, as amended by June 2015 Special Session Public Act 15-5.

State law requires a minimum of twenty-five (25%) percent of the state-funded portion of the contract be set aside for award to subcontractors holding current certification from the Connecticut Department of Administrative Services ("DAS") under the provisions of CONN. GEN. STAT. § 4a-60g. (25% of the total state-funded value with DAS-certified Small Businesses and 6.25% of the total state-funded value with DAS-certified Minority-, Women-, and/or Disabled-owned Businesses.) The contractor must demonstrate good faith effort to meet the 25% set-aside goals.

In addition, Sections 46a-68c and 46a-68d of the Connecticut General Statutes requires that prior to the award of this contract by this agency, the apparent successful bidder must have its company affirmative action plan approved by the Commission on Human Rights and Opportunities. The apparent successful bidder must submit its affirmative action plan to the Commission on Human Rights and Opportunities within 30 days of notice that it has been identified as the apparent successful bidder. The Commission will review the affirmative action plan as required by Sections 46a-68j-25 through 29 of the Administrative Regulations of Connecticut State Agencies within 120 days of submission. When the plan is approved, the Commission will notify the apparent successful bidder and this agency so the contract may be

awarded.

Contractors seeking assistance in the preparation of an affirmative action plan should attend a virtual training session by clicking this link: [Technical Assistance TA Sessions \(ct.gov\)](#)

27. NON-DISCRIMINATION IN EMPLOYMENT - Contracts for work under this proposal will obligate the contractors and subcontractors not to discriminate in employment practices. The Contractor must comply with all applicable State, Federal and Local statutes dealing with non-discriminatory practices.

The Contractor shall take affirmative action to insure that applicants for employment are employed, and that employees are treated during employment, except in the case of a bona fide occupational qualification or need, without regard to their race, color, religious creed, age, sex, sexual orientation, marital status, national origin, mental retardation, learning disability, or physical disability. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

The Contractor shall post in conspicuous places and make available to employees and applicants for employment, notices to be provided by the State setting forth the provisions of this nondiscrimination clause. The Contractor shall state that all qualified applicants will receive consideration for employment without regard to their race, color, religious creed, age, sex, sexual orientation, marital status, national origin, mental retardation, or physical disability.

The Contractor shall incorporate the requirements of this paragraph in all subcontracts for Work performed under this Agreement.

28. WAGE RATES - Where the project is for new public works construction greater than \$1,000,000 or repair or rehabilitation work is greater than \$100,000, the Contractor must abide by State Wage Rates as published by Department of Labor in accordance with Connecticut General Statute Sec. 31-53(g).

The wages paid on an hourly basis to any mechanic, laborer or workman employed upon the Work herein contracted to be done and the amount of payment or contribution paid or payable on behalf of each such employee to any employee welfare fund, as defined in Section 31-53 (h) of the Connecticut General Statutes, shall be at a rate equal to the rate customary or prevailing for the same work in the same trade or occupation in the town where the work is being performed. Any contractor who is not obligated by agreement to make payment or contribution on behalf of such employees to any such employee welfare fund shall pay to each employee as part of his wages, the amount of payment or contribution for his classification on each pay day.

29. OVERTIME AND HOLIDAY WORK - Bidders are advised that all bids are to be premised on the assumption that work will be performed during regular working hours, from 7:30 AM to 5:00 PM, Monday to Friday. Where overtime (after 5:00 PM), work on holidays, or work on weekends, is required, written permission must be obtained from the Owner or its delegated officials. The Contractor is required to pay for all costs of engineering field work and inspections which is made necessary by the Contractor's operations on such days/times. The Contractor shall not be entitled

to additional compensation for work outside regular working hours. Also note that required working hours, when construction is along state roads, shall meet the State Department of Transportation requirements.

30. TRAFFIC CONTROL - A Traffic Control Plan with advance notification, signage, temporary barricades, warning lights, cones, barriers, etc. must be submitted to the Town of Brookfield Police Department for approval, as required. This plan must also be submitted to CONNDOT as part of the road opening permit application. The cost of traffic controllers must be included in the prices bid. Also as per DOT requirements the work performed on state roads will be between the hours of 9:00 AM and 4:30 PM.

31. NON-COLLUSION; NO KICKBACKS - The Contractor warrants that no person has been employed or retained to solicit or secure the Agreement upon an agreement or understanding for a commission, percentage, brokerage or contingent fee; and that no Commissioner or any employee of the Owner has any interest, financially or otherwise, in the Contractor's organization.

For breach or violation of this warranty, and without limiting any other remedies provided by law, the Owner shall have the right to terminate the Agreement without liability or at its discretion to deduct from the Contract Price or consideration, the full amount of such commission, percentage, brokerage or contingent fee.

32. PAYMENTS TO SUBCONTRACTORS - The Contractor must comply with Section 49-41a (as more fully provided in Article 39 of the General Conditions) of the Connecticut General Statutes, as to payment to subcontractors.

33. USE OF LOCAL LABOR - In the employment of mechanics, laborers, and workers, in the performance of the Contract, the Contractor shall give preference to citizens who are, and continuously for six months prior to the contract date, have been residents of the Town of Brookfield; and if no such persons are available; then to residents of the State of Connecticut, if no such persons are available, then to residents of other States, in accordance with Section 31-52, and 31-53 of the Connecticut General Statutes.

34. SAFETY - Bidders are notified that the Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs necessary to the safe and proper performance of the work and that the Contractor shall be solely responsible for taking all necessary precautions to insure the safety of all employees, subcontractors and other persons, including the public, exposed to the contract work. The Contractor shall comply with all current safety requirements mandated by the Occupational Health and Safety Act (OSHA), the Connecticut Department of Transportation (DOT), and any other applicable State statutes.

In addition to any other indemnification provisions contained in the Contract Documents, the Contractor shall at all times indemnify and save harmless the Owner, the Town of Brookfield, The Water Pollution Control Authority, the Engineer, and their officers, agents and employees on account of and from any and all claims, damages, losses, judgments, worker's compensation payments, litigation expenses, and counsel fees arising out of injuries to any person (including death) or damage to property alleged to have been sustained by any person as a result of the acts, omissions, or neglect of the Contractor, its employees or subcontractors. The existence of

insurance shall in no way limit the scope of this indemnification. The Contractor shall further be liable to the Owner, the Town of Brookfield, the Engineer, and their officers, agents and employees for all attorneys' fees, costs and other expenses incurred by it or them in enforcing this indemnity provision, provided however, that the Contractor is found to be liable for injury as a result of any act, omission or neglect by it or its employees or subcontractors.

Neither action nor inaction on the part of the Engineer or Owner, or their representatives, shall make them responsible for safe conditions, or make them liable for bodily injury or property damage on this project.

35. **STATE REQUIREMENTS** - If needed, the Contractor must obtain a General Permit for the Discharge of Stormwater and Dewatering Waste waters from construction activities, as issued by the State Department of Energy and Environmental Protection.

36. **NOT USED**

37. **NOT USED**

38. **PAYMENT OF TAXES, CHARGES AND ASSESSMENTS** - Each person who submits a bid shall be deemed to have agreed that the Owner may apply payments otherwise properly due to such person to the reduction of all real estate or personal property taxes and/or sewer charges and assessments (including interest, fees and penalties thereon) owed to the town or Owner by such person, which taxes are delinquent and have been so delinquent for a period of not less than one (1) year. Prior to making any payment to any person awarded the contract, the Owner shall ascertain from the Tax or Sewer Collector whether such person owes past due taxes on real or personal property or sewer charges or assessments and shall deduct from such payment the amount of taxes or charges (plus penalties, interest and fees thereon) which are delinquent and have been delinquent for a period of at least one (1) year as of the time of withholding.

39. **EXEMPTION FROM TAXES** - State and Local sales taxes on construction materials required for construction shall not be included in the bid. The Brookfield Water Pollution Control Authority is exempt from payment of State and Compensating Use Taxes of the State of Connecticut on all materials sold to it, or for the project pursuant to the provisions of the Contract Documents. The purchase by subcontractors of materials to be furnished pursuant to the provisions of the contract shall be a purchase for resale to the Contractor (either direct or through other subcontractors) and hence exempt from sales tax, regardless of the terms of the contract between the prime contractor and the subcontractor.

40. **WIDTH OF OPERATIONS** - The bidder's attention is directed to the width limitations for operations in various portions of the project.

During construction, the Contractor will be required to perform operations as follows:

- a) Where so indicated, no activities will be permitted outside the limits of work. Work must be confined to in-line operation, unless otherwise authorized in writing.

- b) Staging areas are to be established in field consultation between the Contractor, the Engineer, and the WPCA representative. Such areas will not exceed 2,000 sq. feet, and are to be delineated by snow fencing.
- c) Quantiles for restoration items such as pavement, concrete, and all others will be calculated based on the pay limits shown on the drawings and details. Disturbance beyond these limits will NOT be considered as part of the restoration quantiles for any reason, regardless of cause or conditions.

INFORMATION FOR BIDDERS

1. **RECEIPT AND OPENING OF BIDS** - The Brookfield Water Pollution Control Authority (hereafter called the "Authority" or the "Owner") will receive sealed bids for "Brookfield Market Sewer Main Extension, Contract 2022-01" at the office of the Brookfield Water Pollution Control Authority, Brookfield Municipal Center, 53A Commerce Road, Unit1, Brookfield, CT. until 2:00 PM local time on January 5, 2023 at which time they will be opened and announced.

Proposals shall be enclosed in opaque sealed envelopes plainly marked "Brookfield Market Sewer Main Extension, Contract 2022-01", with the name and address of the bidder.

No bids will be received by mail.

2. **CONTRACT DOCUMENTS** - Contract Documents will be obtained from the Brookfield Water Pollution Control Portal. Refer to the Advertisement to Bid for the information to access the Portal. If you the contractor has any questions to access the Portal, please call (203)-775-7319 x 1000.

3. **DESCRIPTION OF WORK** - The work covered under this contract includes the installation of sanitary pump stations, sewer force mains, 8-inch diameter gravity sewer with 4 manholes, sanitary sewer service laterals, associated appurtenances, associated appurtenances, and site restoration as required in the Contract Documents.

4. **ADDENDA AND INTERPRETATIONS** - No interpretations of the meaning of the Contract Documents will be made to any prospective bidder orally. Every request for such interpretation should be in writing addressed to Langan CT, Inc., 1 North Broadway – Suite 910, White Plains, New York 10601, or via email to cutschig@langan.com, and to be given consideration must be received on or before the end of the business day on December 9, 2022 via email or regular mail. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the Contract Documents which will be emailed with return receipt to all prospective bidders (at the respective email address furnished for such purposes) not later than the end of the business day on December 16, 2022. Failure of any bidder to receive any such addenda or interpretations shall not relieve said bidder from any obligations under his bid as submitted. All addenda so issued shall become part of the Contract Documents.

5. **OBLIGATION OF BIDDER** - Each bidder must inform himself fully of the conditions relating to the construction and the labor provisions under which the work will be performed; failure to do so will not relieve a successful bidder of his obligation to furnish all material and labor necessary to carry out the provisions of the Contract Documents and to complete the contemplated work for the consideration set forth in his bid.

At the time of the opening of bids each bidder will be presumed to have inspected the sites and to have read and to be thoroughly familiar with the Contract Documents (including all addenda). The failure or omission of any bidder to receive or examine any form, instrument, or document shall in no way relieve any bidder from any obligation in respect to his bid.

Bidders are notified that it is obligatory upon them to obtain by their own means information which they may require as to the existing physical condition, and in particular as to subsurface and ground water conditions. The Owner will make available to the bidder all information obtained by investigations prior to the bid openings, but makes no guarantee with respect to the accuracy of such information, and each bidder in bidding represents that he relies exclusively upon his own investigations, and he makes his bid with a full knowledge of all conditions, and the kinds, quality, and quantity of work required.

6. SUBSURFACE UTILITIES - The approximate locations of certain existing subsurface pipes and structures are indicated on the drawings. The Owner does not guarantee that the locations and/or depths of such utilities are even approximately correct. Contractor must contact "Call Before You Dig" 1-800-922-4455, or 203-281-5435. In addition, the contractor is obligated to retain the services of a qualified utility locator company to have all existing utilities located on the project site prior to the start of any work. This effort is critically important for this project and any existing utility information that affects the design of this project must be reported to the BWPCA prior to the start of construction and prior to the ordering of any materials. Refer to item 16 of "Information for Bidders."

7. INFORMATION NOT GUARANTEED - All information given on the drawings, or in the Contract Documents, relative to materials encountered, subsurface conditions, and existing pipes and structures is from the best sources at present available to the Owner. All such information and the drawings of existing construction are furnished only for the convenience of bidders.

It is understood and agreed that the Owner does not warrant or guarantee that the materials, conditions, and pipes or other structures encountered during construction will be the same as those indicated by the information given on the drawings. The bidder must satisfy himself regarding the character, quantities, and conditions of the various materials and the work to be done.

It is understood and agreed that the bidder or the Contractor will not use any of the information made available to him, or obtained in any examination made by him, in any manner as a basis or ground for claim or demand of any nature against the Owner or the Engineer, arising from or by reason of any variance which may exist between the information offered and the actual materials or structures encountered during the construction work.

8. PREPARATION OF PROPOSAL - Proposals must be submitted on the prescribed form. All blank spaces for unit prices, extended totals, and summations must be filled in, in ink or typewritten, in both words and figures. The bidder must sign the bid, and give his title and business address. All forms attached to the Proposal shall be completed by the bidder and submitted with the bid as well as any other documentation requested by these bid documents and required by law.

9. ERRORS IN BID - In the event there is a discrepancy between the unit prices (if any) and the extended totals, the unit price shall govern. In the event there is a discrepancy between prices written in words and written in figures, the prices written in words shall govern. In case of error in the bidder's extended summation, the computed total of the Engineer shall govern.

If an error in any bid item is obvious, and is corroborated by extensions or additions, the Owner may make the appropriate correction and accept the bid.

10. **APPROXIMATE QUANTITIES** - The quantities given in the Proposal are approximate only, being given as a basis for the uniform comparison of bids, and the Owner does not expressly or by implication agree that the actual amount of work will correspond therewith.

11. **BIDDERS TO CHECK APPROXIMATE QUANTITIES** - Bidders must satisfy themselves by personal examination of the location of the proposed work, and by such other means as they may choose, as to the actual conditions and requirements of the work, and the accuracy of the estimate of the Engineer, and shall not, at any time after the submission of a bid, dispute or complain of such statement or estimate of the Engineer, nor assert that there has been any misunderstanding in regard to the nature or amount of the work to be done.

12. **PRICES NOT CHANGED BY CHANGE OF QUANTITIES** - An increase or decrease in the quantities listed in the Proposal for any item shall not be regarded as sufficient grounds for an increase or decrease in the unit price of that item, nor in the time allowed for the completion of the work, except as provided in the Contract. The Owner reserves the right to delete portions of the work, or to add to the work, as it deems necessary, and such changes shall be based upon the unit prices bid or upon reasonable prices established by the Engineer.

13. **INFORMAL BIDS** - The Owner may reject as informal, bids, which are incomplete, conditional, or obscure, or which contain additions not called for, erasures not properly initialed, alterations or irregularities of any kind, or the Owner may waive such informalities.

14. **INTENT OF CONTRACT DOCUMENTS** - The intent of the Contract Documents is to obtain a complete job, satisfactory to the Owner and the Engineer. It shall be understood that the bidder is cognizant of the full requirements of the Contract, and has based his Proposal upon such understanding. Compensation for all work and materials required to complete the Contract shall be considered included in the price bid in the Proposal.

15. **RIGHT TO ACCEPT OR REJECT BIDS** - The Owner reserves the right to select the lowest responsive and responsible bid, to waive any informalities in the bids, to reject any or all bids, and to make its awards in the best interests of the Town of Brookfield. Conditional bids may be rejected.

16. **LOCATING UTILITIES** - The Contractor shall obtain advance information on the vertical and horizontal location of all utilities, structures, or other facilities located within the project area. Such information shall be obtained from utility mark-outs, test pits, or pipe locating devices, and the obtaining of such information is exclusively the Contractor's responsibility. Any conflicts must be reported to the Engineer sufficiently in advance of the work schedule to avoid delays or extra work. The cost of obtaining such advance information shall be included in the prices bid for the various items of work.

17. **BID SECURITY** - Each bid must be accompanied by a cashier's check, a certified check of the bidder or a bid bond issued by a surety company licensed to issue such bonds in the State of Connecticut in the amount of five percent (5%) of the amount of the bid, drawn to the

benefit of the Brookfield Water Pollution Control Authority. Such checks will be returned to all except the three lowest responsive bidders within three days after the opening of bids. The remaining checks will be returned to the three lowest bidders within 48 hours after the Owner and the accepted bidder have executed the Contract, or if no Contract has been so executed, within 120 days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his bid. Bid bonds will not be returned, except on written request.

18. CONSENT OF SURETY/SURETY GUARANTEE - In addition to the checks or bid bonds for bid security, each bid must be accompanied by a guaranty from a surety company, qualified and authorized to do business in this State, and having an A.M. Best & Co. rating of at least A-minus, agreeing to furnish Performance and Payment Bonds, each in the full amount of the contract price in the event of award of Contract.

19. QUALIFICATION OF BIDDER - The Owner may make such investigations as are deemed necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of such bidder, fails to satisfy the Owner that such bidder is properly qualified and/or financially capable to carry out the obligations of the contract and to complete the work contemplated therein within the time limit stipulated.

20. WITHDRAWAL OF BIDS - Upon proper request and identification, a bidder may withdraw his bid prior to the scheduled time for the opening thereof. However, no bid may be withdrawn after the first bid has been opened and thereafter not for a period of 120 days after the date of the opening thereof.

21. LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT - The successful bidder, upon his failure or refusal to execute and deliver the Contract and the required Performance and Payment Bonds within twenty (20) days after he has received notice of the acceptance of his bid, shall forfeit to the Owner as liquidated damages for such failure or refusal, the security deposited with his bid.

22. CONTRACT BONDS AND INSURANCE - Simultaneously with his delivery of the executed Contract, the successful bidder must deliver to the Owner Performance and Payment (labor and materials) bonds, each in the amount of one hundred percent (100%) of the accepted bid, as security for the faithful performance of his Contract, and for the payment of all persons performing labor or furnishing materials in connection therewith; prepared in a form acceptable to the Owner (see forms attached) and having as security thereon such surety company or companies as are acceptable to the Owner and as are authorized to transact business in this State, and having an A.M. Best & Co. rating of at least A-minus. The bonds shall comply with Section 49-41 et seq. of the Connecticut General Statutes.

Simultaneously with the delivery of the executed contract, the successful bidder must deliver approvable insurance certifications, as specified in Article 8 of the General Conditions.

The Contractor shall obtain and pay for, and shall provide proof of insurance for the types and limits of insurance as more particularly specified in Article 8 for the General Conditions.

23. EXECUTION OF CONTRACT - The bidder to whom the contract is awarded will be required to furnish the Contract Bonds duly executed by a satisfactory surety (as defined above), and to execute the contract within the time limit stated in the Proposal after notification that the contract is ready for signature.

24. POWER OF ATTORNEY - Attorneys-in-fact who sign Contract Bonds must file with each bond a certified and effectively dated copy of their power of attorney.

25. TIME FOR COMPLETION AND LIQUIDATED DAMAGES - The bidder to whom the contract is awarded must agree to commence work within 20 days from the date of receipt of written notice to proceed from the Owner, and shall complete the work in all respects except for maintenance and placement of permanent pavement within 270 consecutive calendar days following the service of said notice. Liquidated damages for late completion shall be as stipulated in the Contract.

26. LAWS AND REGULATIONS - This contract will be governed by the laws of the State of Connecticut. The attention of the bidder is specifically directed to the provisions of the General Conditions relative to laws and ordinances, State Labor Standards, Non-discrimination Provisions and Safety Provisions.

27. NON-DISCRIMINATION IN EMPLOYMENT - Contracts for work under this proposal will obligate the contractors and subcontractors not to discriminate in employment practices. The Contractor must comply with all applicable State, Federal and Local statutes dealing with non-discriminatory practices.

The Contractor shall take affirmative action to insure that applicants for employment are employed, and that employees are treated during employment, except in the case of a bona fide occupational qualification or need, without regard to their race, color, religious creed, age, sex, sexual orientation, marital status, national origin, mental retardation, learning disability, or physical disability. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

The Contractor shall post in conspicuous places and make available to employees and applicants for employment, notices to be provided by the State setting forth the provisions of this nondiscrimination clause. The Contractor shall state that all qualified applicants will receive consideration for employment without regard to their race, color, religious creed, age, sex, sexual orientation, marital status, national origin, mental retardation, or physical disability.

The Contractor shall incorporate the requirements of this paragraph in all subcontracts for Work performed under this Agreement.

28. WAGE RATES - Where the project is for new public works construction greater than \$1,000,000 or repair or rehabilitation work is greater than \$100,000, the Contractor must abide

by State Wage Rates as published by Department of Labor in accordance with Connecticut General Statute Sec. 31-53(g).

The wages paid on an hourly basis to any mechanic, laborer or workman employed upon the Work herein contracted to be done and the amount of payment or contribution paid or payable on behalf of each such employee to any employee welfare fund, as defined in Section 31-53 (h) of the Connecticut General Statutes, shall be at a rate equal to the rate customary or prevailing for the same work in the same trade or occupation in the town where the work is being performed. Any contractor who is not obligated by agreement to make payment or contribution on behalf of such employees to any such employee welfare fund shall pay to each employee as part of his wages, the amount of payment or contribution for his classification on each pay day.

29. OVERTIME AND HOLIDAY WORK - Bidders are advised that all bids are to be premised on the assumption that work will be performed during regular working hours, from 7:30 AM to 5:00 PM, Monday to Friday. Where overtime (after 5:00 PM), work on holidays, or work on weekends, is required, written permission must be obtained from the Owner or its delegated officials. The Contractor is required to pay for all costs of engineering field work and inspections which is made necessary by the Contractor's operations on such days/times. The Contractor shall not be entitled to additional compensation for work outside regular working hours. Also note that required working hours, when construction is along state roads, shall meet the State Department of Transportation requirements.

30. TRAFFIC CONTROL - A Traffic Control Plan with advance notification, signage, temporary barricades, warning lights, cones, barriers, etc. must be submitted to the Town of Brookfield Police Department for approval, as required. This plan must also be submitted to CONNDOT as part of the road opening permit application. The cost of traffic controllers must be included in the prices bid. Also as per DOT requirements the work performed on state roads will be between the hours of 9:00 AM and 4:30 PM.

31. NON-COLLUSION; NO KICKBACKS - The Contractor warrants that no person has been employed or retained to solicit or secure the Agreement upon an agreement or understanding for a commission, percentage, brokerage or contingent fee; and that no Commissioner or any employee of the Owner has any interest, financially or otherwise, in the Contractor's organization.

For breach or violation of this warranty, and without limiting any other remedies provided by law, the Owner shall have the right to terminate the Agreement without liability or at its discretion to deduct from the Contract Price or consideration, the full amount of such commission, percentage, brokerage or contingent fee.

32. PAYMENTS TO SUBCONTRACTORS - The Contractor must comply with Section 49-41a (as more fully provided in Article 39 of the General Conditions) of the Connecticut General Statutes, as to payment to subcontractors.

33. USE OF LOCAL LABOR - In the employment of mechanics, laborers, and workers, in the performance of the Contract, the Contractor shall give preference to citizens who are, and

continuously for six months prior to the contract date, have been residents of the Town of Brookfield; and if no such persons are available; then to residents of the State of Connecticut, if no such persons are available, then to residents of other States, in accordance with Section 31-52, and 31-53 of the Connecticut General Statutes.

34. **SAFETY** - Bidders are notified that the Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs necessary to the safe and proper performance of the work and that the Contractor shall be solely responsible for taking all necessary precautions to insure the safety of all employees, subcontractors and other persons, including the public, exposed to the contract work. The Contractor shall comply with all current safety requirements mandated by the Occupational Health and Safety Act (OSHA), the Connecticut Department of Transportation (DOT), and any other applicable State statutes.

In addition to any other indemnification provisions contained in the Contract Documents, the Contractor shall at all times indemnify and save harmless the Owner, the Town of Brookfield, The Water Pollution Control Authority, the Engineer, and their officers, agents and employees on account of and from any and all claims, damages, losses, judgments, worker's compensation payments, litigation expenses, and counsel fees arising out of injuries to any person (including death) or damage to property alleged to have been sustained by any person as a result of the acts, omissions, or neglect of the Contractor, its employees or subcontractors. The existence of insurance shall in no way limit the scope of this indemnification. The Contractor shall further be liable to the Owner, the Town of Brookfield, the Engineer, and their officers, agents and employees for all attorneys' fees, costs and other expenses incurred by it or them in enforcing this indemnity provision, provided however, that the Contractor is found to be liable for injury as a result of any act, omission or neglect by it or its employees or subcontractors.

Neither action nor inaction on the part of the Engineer or Owner, or their representatives, shall make them responsible for safe conditions, or make them liable for bodily injury or property damage on this project.

35. **STATE REQUIREMENTS** - If needed, the Contractor must obtain a General Permit for the Discharge of Stormwater and Dewatering Waste waters from construction activities, as issued by the State Department of Energy and Environmental Protection.

36. **NOT USED**

37. **NOT USED**

38. **PAYMENT OF TAXES, CHARGES AND ASSESSMENTS** - Each person who submits a bid shall be deemed to have agreed that the Owner may apply payments otherwise properly due to such person to the reduction of all real estate or personal property taxes and/or sewer charges and assessments (including interest, fees and penalties thereon) owed to the town or Owner by such person, which taxes are delinquent and have been so delinquent for a period of not less than one (1) year. Prior to making any payment to any person awarded the contract, the Owner shall ascertain from the Tax or Sewer Collector whether such person owes past due taxes on real or personal property or sewer charges or assessments and shall deduct from such

payment the amount of taxes or charges (plus penalties, interest and fees thereon) which are delinquent and have been delinquent for a period of at least one (1) year as of the time of withholding.

39. EXEMPTION FROM TAXES - State and Local sales taxes on construction materials required for construction shall not be included in the bid. The Brookfield Water Pollution Control Authority is exempt from payment of State and Compensating Use Taxes of the State of Connecticut on all materials sold to it, or for the project pursuant to the provisions of the Contract Documents. The purchase by subcontractors of materials to be furnished pursuant to the provisions of the contract shall be a purchase for resale to the Contractor (either direct or through other subcontractors) and hence exempt from sales tax, regardless of the terms of the contract between the prime contractor and the subcontractor.

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During construction, the Contractor will be required to perform operations as follows:

- a) Where so indicated, no activities will be permitted outside the limits of work. Work must be confined to in-line operation, unless otherwise authorized in writing.
- b) Staging areas are to be established in field consultation between the Contractor, the Engineer, and the WPCA representative. Such areas will not exceed 2,000 sq. feet, and are to be delineated by snow fencing.
- c) Quantiles for restoration items such as pavement, concrete, and all others will be calculated based on the pay limits shown on the drawings and details. Disturbance beyond these limits will NOT be considered as part of the restoration quantiles for any reason, regardless of cause or conditions.

**PROPOSAL, BIDDER'S AFFIDAVIT, BID BOND,
SURETY GUARANTEE AND OTHER FORMS,**

TOWN OF BROOKFIELD, CONNECTICUT

Brookfield Market Sewer Main Extension - BWPCA Improvements

Langan Job No. 190011055

WPCA CONTRACT NO. 2022-01

PROPOSAL

Brookfield Water Pollution Control Authority
 53A Commerce Road, Unit 1
 Brookfield, Connecticut 06804

Made by _____

P.O./ Address _____

Gentlemen:

Pursuant to and in compliance with your request for bids, the undersigned states that he has examined the Contract Documents and the site of the work, made all investigations which he has deemed necessary or desirable, and that he understands the purport and magnitude of the work intended, and the undersigned hereby offers to furnish all plant, labor, material, supplies, equipment, and other facilities and things necessary or proper for or incidental to the proper construction of the work advertised, and to construct the said work in strict accordance with the Contract Documents of which this Proposal is a part and such detailed directions, plans, and drawings as may be furnished from time to time during the progress of construction by the Engineer at the following prices, which prices include all incidental work including traffic control:

SCHEDULE OF PRICES

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
1	1	L.S.	Mobilization				
			L.S.				
2	750	S.Y.	Sawcut and Remove Existing Pavement				
			S.Y.				

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
3	6	S.Y.	Sawcut and Remove Existing Concrete Driveway				
			S.Y.				
4	8	EA.	Test Pit in Pavement				
			EA.				
5	310	L.F.	8" Dia. PVC Sewer Pipe				
			L.F.				
6	6	L.F.	1.5" Dia. PVC Sewer Force Main				
			L.F.				
7	1400	L.F.	1-1/2" Dia. PVC Force Main				
			L.F.				
8	57	L.F.	Gravity Sewer Connection (6" Dia. PVC)				
			L.F.				
9	10	C.Y.	Concrete Encasement				
			C.Y.				

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
10	2	EA.	Manhole with Cover (0 - 6'6" deep)				
			EA.				
11	2	EA.	Manhole with cover (> 6'6" deep)				
			EA.				
12	1	EA.	Force Main Connection to Existing Manhole				
			EA.				
13	1	EA.	Forcemain Cleanout at Valve				
			EA.				
14	2	EA.	Curb Valve and Box				
			EA.				
15	2	EA.	Dual Force Main Cleanout Manhole				
			EA.				
16	1	EA.	Force Main Cleanout Manhole				
			EA.				
17	1	EA.	Pump and Decommission Seepage Pit				
			EA.				
18	375	S.Y.	CTDOT Pavement Restoration				
			S.Y.				

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
19	350	S.Y.	Driveway Pavement Restoration				
			S.Y.				
20	50	S.F.	Concrete Sidewalk/ Driveway Restoration				
			S.F.				
21	400	S.F.	Stamped Bituminous Concrete Crosswalk				
			S.F.				
22	8	L.F.	Reconstruct Stone Curb				
			L.F.				
23	6	L.F.	Reconstruct Bituminous Concrete Curb				
			L.F.				
24	1	L.S.	Flagstone Walk Restoration				
			L.S.				
25	1	L.S.	Lawn Restoration				
			L.S.				
26	1	L.S.	Pavement Marking Restoration				
			L.S.				
27	1	EA.	Tree Removal				
			EA.				

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
28	8	EA.	Inlet Protection				
			EA.				
29	860	L.F.	Silt Fence				
			L.F.				
30	1	EA.	Pump Station No. 1				
			EA.				
31	1	L.S.	Electrical Equipment and Power Feed for Pump Station No. 1				
			L.S.				
32	1	EA.	Pump Station No. 7				
			EA.				
33	1	L.S.	Electrical Equipment and Power Feed for Pump Station No. 7				
			L.S.				
34	1	L.S.	As-Builts				
			L.S.				
35	160	C.Y.	Allowance for Rock				
			C.Y.				
36	1	L.S.	Miscellaneous Additional work	60,000	00	60,000	00
			L.S.				
37	1	L.S.	Heat Trace Forcemain in Road				
			L.S.				
38	1	L.S.	Maintenance and Protection of Traffic				
			L.S.				

SUMMATION OF BASE BID ITEMS	
	DOLLARS
	CENTS (\$ _____)

TOWN OF BROOKFIELD, CONNECTICUT

Brookfield Market Sewer Main Extension - BWPCA Improvements

Langan Job No. 190011055

WPCA CONTRACT NO. 2022-01

PROPOSAL

Brookfield Water Pollution Control Authority
 53A Commerce Road, Unit 1
 Brookfield, Connecticut 06804

Made by _____

P.O./ Address _____

Gentlemen:

Pursuant to and in compliance with your request for bids, the undersigned states that he has examined the Contract Documents and the site of the work, made all investigations which he has deemed necessary or desirable, and that he understands the purport and magnitude of the work intended, and the undersigned hereby offers to furnish all plant, labor, material, supplies, equipment, and other facilities and things necessary or proper for or incidental to the proper construction of the work advertised, and to construct the said work in strict accordance with the Contract Documents of which this Proposal is a part and such detailed directions, plans, and drawings as may be furnished from time to time during the progress of construction by the Engineer at the following prices, which prices include all incidental work including traffic control:

SCHEDULE OF PRICES

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
1	1	L.S.	Mobilization				
			L.S.				
2	750	S.Y.	Sawcut and Remove Existing Pavement				
			S.Y.				

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
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			EA.				
5	310	L.F.	8" Dia. PVC Sewer Pipe				
			L.F.				
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7	1400	L.F.	1-1/2" Dia. PVC Force Main				
			L.F.				
8	57	L.F.	Gravity Sewer Connection (6" Dia. PVC)				
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ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
10	2	EA.	Manhole with Cover (0 - 6'6" deep)				
			EA.				
11	2	EA.	Manhole with cover (> 6'6" deep)				
			EA.				
12	1	EA.	Force Main Connection to Existing Manhole				
			EA.				
13	1	EA.	Forcemain Cleanout at Valve				
			EA.				
14	2	EA.	Curb Valve and Box				
			EA.				
15	2	EA.	Dual Force Main Cleanout Manhole				
			EA.				
16	1	EA.	Force Main Cleanout Manhole				
			EA.				
17	1	EA.	Pump and Decommission Seepage Pit				
			EA.				
18	375	S.Y.	CTDOT Pavement Restoration				
			S.Y.				

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
19	350	S.Y.	Driveway Pavement Restoration				
			S.Y.				
20	50	S.F.	Concrete Sidewalk/ Driveway Restoration				
			S.F.				
21	400	S.F.	Stamped Bituminous Concrete Crosswalk				
			S.F.				
22	8	L.F.	Reconstruct Stone Curb				
			L.F.				
23	6	L.F.	Reconstruct Bituminous Concrete Curb				
			L.F.				
24	1	L.S.	Flagstone Walk Restoration				
			L.S.				
25	1	L.S.	Lawn Restoration				
			L.S.				
26	1	L.S.	Pavement Marking Restoration				
			L.S.				
27	1	EA.	Tree Removal				
			EA.				

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
28	8	EA.	Inlet Protection				
			EA.				
29	860	L.F.	Silt Fence				
			L.F.				
30	1	EA.	Pump Station No. 1				
			EA.				
31	1	L.S.	Electrical Equipment and Power Feed for Pump Station No. 1				
			L.S.				
32	1	EA.	Pump Station No. 7				
			EA.				
33	1	L.S.	Electrical Equipment and Power Feed for Pump Station No. 7				
			L.S.				
34	1	L.S.	As-Builts				
			L.S.				
35	160	C.Y.	Allowance for Rock				
			C.Y.				
36	1	L.S.	Miscellaneous Additional work				
			L.S.				
37	1	L.S.	Heat Trace Forcemain in Road				
			L.S.				
38	1	L.S.	Maintenance and Protection of Traffic				
			L.S.				

SUMMATION OF BASE BID ITEMS	
	DOLLARS
	CENTS (\$ _____)

TOWN OF BROOKFIELD, CONNECTICUT

Brookfield Market Sewer Main Extension – 1 Tucks Road

Langan Job No. 190011055

WPCA CONTRACT NO. 2022-01

PROPOSAL

Brookfield Water Pollution Control Authority
 53A Commerce Road, Unit 1
 Brookfield, Connecticut 06804

Made by _____

P.O./ Address _____

Gentlemen:

Pursuant to and in compliance with your request for bids, the undersigned states that he has examined the Contract Documents and the site of the work, made all investigations which he has deemed necessary or desirable, and that he understands the purport and magnitude of the work intended, and the undersigned hereby offers to furnish all plant, labor, material, supplies, equipment, and other facilities and things necessary or proper for or incidental to the proper construction of the work advertised, and to construct the said work in strict accordance with the Contract Documents of which this Proposal is a part and such detailed directions, plans, and drawings as may be furnished from time to time during the progress of construction by the Engineer at the following prices, which prices include all incidental work including traffic control:

SCHEDULE OF PRICES

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
1	1	EA.	Connect Existing Service Line				
		EA.					
2	34	L.F.	Gravity Sewer Connection (6 Dia. PVC)				
		L.F.					

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
3	1	EA.	Sanitary Sewer Cleanout				
			EA.				
4	1	EA.	Septic Tank and Convert to Grease Trap				
			EA.				
5	1	L.S.	Lawn Restoration				
			L.S.				
6	1	L.S.	Stone Patio Restoration				
			L.S.				
7	2	C.Y.	Allowance for Rock				
			C.Y.				

SUMMATION OF BASE BID ITEMS	
	DOLLARS
	CENTS
	(\$ _____)

TOWN OF BROOKFIELD, CONNECTICUT

Brookfield Market Sewer Main Extension – 12 Tucks Road

Langan Job No. 190011055

WPCA CONTRACT NO. 2022-01

PROPOSAL

Brookfield Water Pollution Control Authority
 53A Commerce Road, Unit 1
 Brookfield, Connecticut 06804

Made by _____

P.O./ Address _____

Gentlemen:

Pursuant to and in compliance with your request for bids, the undersigned states that he has examined the Contract Documents and the site of the work, made all investigations which he has deemed necessary or desirable, and that he understands the purport and magnitude of the work intended, and the undersigned hereby offers to furnish all plant, labor, material, supplies, equipment, and other facilities and things necessary or proper for or incidental to the proper construction of the work advertised, and to construct the said work in strict accordance with the Contract Documents of which this Proposal is a part and such detailed directions, plans, and drawings as may be furnished from time to time during the progress of construction by the Engineer at the following prices, which prices include all incidental work including traffic control:

SCHEDULE OF PRICES

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
1	103	S.Y.	Sawcut and Remove Existing Pavement				
			S.Y.				
2	25	L.F.	1-1/2" Dia. PVC Force Main				
			L.F.				

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
3	235	L.F.	Gravity Sewer Connection (6" Dia. PVC)				
			L.F.				
4	10	C.Y.	Concrete Encasement				
			C.Y.				
5	4	EA.	Sanitary Sewer Cleanout				
			EA.				
6	2	EA.	Pump Septic tank and Decommission in Place				
			EA.				
7	920	S.F.	Driveway Pavement Restoration				
			C.Y.				
8	60	L.S.	Modular Block Retaining Wall				
			L.S.				
9	56	S.Y.	Lawn Restoration				
			S.F				
10	1	EA.	Inlet Protection				
			EA.				
11	70	L.F.	Silt Fence				
			L.F.				

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
12	1	EA.	Pump Station No.8				
			EA.				
13	1	L.S.	Electrical Equipment and Power Disconnect for Pump Station No.8 (Power Supply Provided By Owner)				
			L.S.				
14	24	C.Y.	Allowance for Rock				
			C.Y.				

SUMMATION OF BASE BID ITEMS	
	DOLLARS
	CENTS
	(\$ _____)

TOWN OF BROOKFIELD, CONNECTICUT

Brookfield Market Sewer Main Extension – 14 Tucks Road

Langan Job No. 190011055

WPCA CONTRACT NO. 2022-01

PROPOSAL

Brookfield Water Pollution Control Authority
 53A Commerce Road, Unit 1
 Brookfield, Connecticut 06804

Made by _____

P.O./ Address _____

Gentlemen:

Pursuant to and in compliance with your request for bids, the undersigned states that he has examined the Contract Documents and the site of the work, made all investigations which he has deemed necessary or desirable, and that he understands the purport and magnitude of the work intended, and the undersigned hereby offers to furnish all plant, labor, material, supplies, equipment, and other facilities and things necessary or proper for or incidental to the proper construction of the work advertised, and to construct the said work in strict accordance with the Contract Documents of which this Proposal is a part and such detailed directions, plans, and drawings as may be furnished from time to time during the progress of construction by the Engineer at the following prices, which prices include all incidental work including traffic control:

SCHEDULE OF PRICES

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
1	100	S.Y.	Sawcut and Remove Existing Pavement				
			S.Y.				
2	145	L.F.	1-1/2" Dia. PVC Force Main				
			L.F.				

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
3	92	L.F.	Gravity Sewer Connection (6" Dia. PVC)				
			L.F.				
4	4	EA.	Sanitary Sewer Cleanout				
			EA.				
5	1	EA.	Pump Septic Tank and Decommission in Place				
			EA.				
6	100	S.Y.	Driveway Pavement Restoration				
			S.Y.				
7	100	S.Y.	Lawn Restoration				
			S.Y.				
8	2	EA.	Tree Removal				
			S.F.				
9	1	EA.	Inlet protection				
			S.F				
10	40	L.F.	Silt fence				
			L.F.				
11	1	EA.	Pump Station No. 9				
			EA.				

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
12	1	L.S.	Electrical Equipment and Power Disconnect for Pump Station No. 9 (Electric Service Provided by Owner)				
			L.S.				
13	23	C.Y.	Allowance for Rock				
			C.Y.				

SUMMATION OF BASE BID ITEMS	
	DOLLARS
	CENTS
	(\$ _____)

TOWN OF BROOKFIELD, CONNECTICUT

Brookfield Market Sewer Main Extension – 272 Whisconier Road

Langan Job No. 190011055

WPCA CONTRACT NO. 2022-01

PROPOSAL

Brookfield Water Pollution Control Authority
 53A Commerce Road, Unit 1
 Brookfield, Connecticut 06804

Made by _____

P.O./ Address _____

Gentlemen:

Pursuant to and in compliance with your request for bids, the undersigned states that he has examined the Contract Documents and the site of the work, made all investigations which he has deemed necessary or desirable, and that he understands the purport and magnitude of the work intended, and the undersigned hereby offers to furnish all plant, labor, material, supplies, equipment, and other facilities and things necessary or proper for or incidental to the proper construction of the work advertised, and to construct the said work in strict accordance with the Contract Documents of which this Proposal is a part and such detailed directions, plans, and drawings as may be furnished from time to time during the progress of construction by the Engineer at the following prices, which prices include all incidental work including traffic control:

SCHEDULE OF PRICES

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
1	10	L.F.	1-1/2" Dia. PVC Force Main				
			L.F.				
2	8	L.F.	Gravity Sewer Connection (6" Dia. PVC)				
			L.F.				

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
3	1	EA.	Sanitary Sewer Cleanout				
			EA.				
4	1	EA.	Pump Septic Tank and Decommission in Place				
			EA.				
5	100	S.Y.	Lawn Restoration				
			S.Y.				
6	30	L.F.	Silt Fence				
			L.F.				
7	1	L.S.	Pump Station No. 3				
			L.S.				
8	1	L.S.	Electrical Equipment and Power Disconnect for Pump Station No. 3 (Power Supply by Owner)				
			L.S.				
9	1	EA.	Connect Existing Service Lines				
			EA.				

SUMMATION OF BASE BID ITEMS	
	DOLLARS
	CENTS (\$ _____)

TOWN OF BROOKFIELD, CONNECTICUT

Brookfield Market Sewer Main Extension – 273 Whisconier Road

Langan Job No. 190011055

WPCA CONTRACT NO. 2022-01

PROPOSAL

Brookfield Water Pollution Control Authority
 53A Commerce Road, Unit 1
 Brookfield, Connecticut 06804

Made by _____

P.O./ Address _____

Gentlemen:

Pursuant to and in compliance with your request for bids, the undersigned states that he has examined the Contract Documents and the site of the work, made all investigations which he has deemed necessary or desirable, and that he understands the purport and magnitude of the work intended, and the undersigned hereby offers to furnish all plant, labor, material, supplies, equipment, and other facilities and things necessary or proper for or incidental to the proper construction of the work advertised, and to construct the said work in strict accordance with the Contract Documents of which this Proposal is a part and such detailed directions, plans, and drawings as may be furnished from time to time during the progress of construction by the Engineer at the following prices, which prices include all incidental work including traffic control:

SCHEDULE OF PRICES

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
1	100	S.Y.	Sawcut and Remove Existing Pavement				
			S.Y.				
2	121	L.F.	Gravity Sewer Connection (6" Dia. PVC)				
			L.F.				

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
3	4	EA.	Sanitary Sewer Cleanout				
			EA.				
4	1	EA.	Converting Existing Septic Tank to Grease Trap				
			EA.				
5	143	S.F.	Driveway Pavement Restoration				
			S.F.				
6	1	EA.	Connect Existing Service Line				
			EA.				

SUMMATION OF BASE BID ITEMS	
	DOLLARS
	CENTS
	(\$ _____)

TOWN OF BROOKFIELD, CONNECTICUT

Brookfield Market Sewer Main Extension – 281 Whisconier Road

Langan Job No. 190011055

WPCA CONTRACT NO. 2022-01

PROPOSAL

Brookfield Water Pollution Control Authority
 53A Commerce Road, Unit 1
 Brookfield, Connecticut 06804

Made by _____

P.O./ Address _____

Gentlemen:

Pursuant to and in compliance with your request for bids, the undersigned states that he has examined the Contract Documents and the site of the work, made all investigations which he has deemed necessary or desirable, and that he understands the purport and magnitude of the work intended, and the undersigned hereby offers to furnish all plant, labor, material, supplies, equipment, and other facilities and things necessary or proper for or incidental to the proper construction of the work advertised, and to construct the said work in strict accordance with the Contract Documents of which this Proposal is a part and such detailed directions, plans, and drawings as may be furnished from time to time during the progress of construction by the Engineer at the following prices, which prices include all incidental work including traffic control:

SCHEDULE OF PRICES

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
1	50	S.Y.	Sawcut and Remove Existing Pavement				
			S.Y.				
2	96	L.F.	Gravity Sewer Connection (6" Dia. PVC)				
			L.F.				

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
3	3	EA.	Sanitary Sewer Cleanout				
			EA.				
4	1	EA.	Septic Tank and Decommission in Place				
			EA.				
5	400	S.F.	Driveway Pavement Restoration				
			S.F.				
6	8	C.Y.	Allowance for Rock				
			C.Y.				
7	1	EA.	Connect Existing Service Line				
			EA.				

SUMMATION OF BASE BID ITEMS	
	DOLLARS
	CENTS
	(\$ _____)

TOWN OF BROOKFIELD, CONNECTICUT

Brookfield Market Sewer Main Extension – 283 Whisconier Road

Langan Job No. 190011055

WPCA CONTRACT NO. 2022-01

PROPOSAL

Brookfield Water Pollution Control Authority
 53A Commerce Road, Unit 1
 Brookfield, Connecticut 06804

Made by _____

P.O./ Address _____

Gentlemen:

Pursuant to and in compliance with your request for bids, the undersigned states that he has examined the Contract Documents and the site of the work, made all investigations which he has deemed necessary or desirable, and that he understands the purport and magnitude of the work intended, and the undersigned hereby offers to furnish all plant, labor, material, supplies, equipment, and other facilities and things necessary or proper for or incidental to the proper construction of the work advertised, and to construct the said work in strict accordance with the Contract Documents of which this Proposal is a part and such detailed directions, plans, and drawings as may be furnished from time to time during the progress of construction by the Engineer at the following prices, which prices include all incidental work including traffic control:

SCHEDULE OF PRICES

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
1	40	S.Y.	Sawcut and Remove Existing Pavement				
			S.Y.				
2	96	L.F.	Gravity Sewer Connection (6" Dia. PVC)				
			L.F.				

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
3	3	EA.	Sanitary Sewer Cleanout				
			EA.				
4	1	EA.	Septic Tank and Decommission in Place				
			EA.				
5	118	S.Y.	Driveway Pavement Restoration				
			S.Y.				
6	1	L.S.	Lawn Restoration				
			L.S.				
7	6	C.Y.	Allowance for Rock				
			C.Y.				

SUMMATION OF BASE BID ITEMS	
	DOLLARS
	CENTS
	(\$ _____)

TOWN OF BROOKFIELD, CONNECTICUT

Brookfield Market Sewer Main Extension – 290 Whisconier Road

Langan Job No. 190011055

WPCA CONTRACT NO. 2022-01

PROPOSAL

Brookfield Water Pollution Control Authority
 53A Commerce Road, Unit 1
 Brookfield, Connecticut 06804

Made by _____

P.O./ Address _____

Gentlemen:

Pursuant to and in compliance with your request for bids, the undersigned states that he has examined the Contract Documents and the site of the work, made all investigations which he has deemed necessary or desirable, and that he understands the purport and magnitude of the work intended, and the undersigned hereby offers to furnish all plant, labor, material, supplies, equipment, and other facilities and things necessary or proper for or incidental to the proper construction of the work advertised, and to construct the said work in strict accordance with the Contract Documents of which this Proposal is a part and such detailed directions, plans, and drawings as may be furnished from time to time during the progress of construction by the Engineer at the following prices, which prices include all incidental work including traffic control:

SCHEDULE OF PRICES

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
1	109	L.F.	Gravity Sewer (6" Dia. PVC)				
			L.F.				
2	5	EA.	Sanitary Sewer Cleanout				
			EA.				

ITEM NO.	EST. QUANTITY	UNIT	ITEM WITH UNIT PRICES (IN WORDS)	UNIT PRICES (IN NUMBERS)		AMOUNT BID	
				Dollars	Cents	Dollars	Cents
3	1	EA.	Septic Tank and Decommission in Place				
			EA.				
4	1	L.S.	Retaining Wall Construction				
			L.S.				
5	1	L.S.	Concrete Walk Restoration				
			L.S.				
6	250	S.Y.	Lawn Restoration				
			S.Y.				
7	1	EA.	500 Gallon Grease Trap				
			EA.				
8	110	L.F.	Silt Fence				
			L.F.				
9	3	EA.	Connect Existing Service Lines				
			EA.				

SUMMATION OF BASE BID ITEMS	
	DOLLARS
	CENTS
	(\$ _____)

The summation of the bid for this contract is based on the prices for the various items. This summation is made with the understanding that it is not a part of the bid and is solely a matter of information for convenience in comparing the bids at the time of opening.

The undersigned proposes to commence work within ten (10) calendar days of receipt of written notice from the Owner so to do, and shall complete the work in all respects except for maintenance and final pavement within 180 calendar days following service of said notice. The undersigned is also aware of the provision of payment to the Owner for liquidated damages should he fail to complete the work within the time stipulated above.

Accompanying this proposal, under separate cover, is a cashier's check, certified check or bid bond for _____ dollars (\$_____) payable to the Owner.

In case this Proposal is accepted by the Owner and the undersigned shall fail to execute the Contract with, and deliver Contract Bonds to the Owner in accordance with the information for Bidders, then the said cashier's check, certified check, or the amount of the Bid Bond shall become the property of the Owner and shall be the maximum obligation of the Contractor or his Surety for the aforesaid failure of the Contractor, otherwise it shall be returned to the undersigned upon request.

If written notice of the acceptance of this bid is mailed, telegraphed, or delivered to the undersigned within ninety (90) days after the date of opening of the bids, or any time thereafter before this bid is withdrawn, the undersigned shall, within ten (10) days after the date of such mailing, telegraphing, or delivering of such notice, execute and deliver a contract in the Form of Contract attached hereto, and Contract Bonds as hereinafter specified. The undersigned hereby designates the above address as his office to which such notice of acceptance may be mailed, telegraphed or delivered.

The bidder hereby acknowledges the receipt of the following issues of addenda, if any, distributed by the Engineer:

Addendum No. _____	Dated _____	Addendum No. _____	Date _____
Addendum No. _____	Dated _____	Addendum No. _____	Date _____
Addendum No. _____	Dated _____	Addendum No. _____	Date _____

The Brookfield Water Pollution Control Authority reserves the right to reject any and all bids for any reason, to waive any informality in the bidding and to award the Contract to the lowest responsible and qualified bidder or the responsible and qualified bidder with the lowest combination of **Base Bid and Alternates, where applicable**, selected by the Authority.

INFORMATION SHOWING QUALIFICATIONS FOR WORK:

THE BIDDER SHALL SUBMIT WITH HIS BID HIS MOST RECENT CERTIFIED FINANCIAL STATEMENT

The bidder shall here furnish the following summary information relative to his ability and financial resources available for the fulfillment of the Contract, if such be awarded to him:

How many consecutive years has he or they been engaged in the construction business under the present firm name? _____

When organized? _____

Where incorporated? _____

Credit available for this Contract \$ _____

Contracts in hand- Number _____

Gross Amount _____

List Permanent Field Personnel _____

List Construction Equipment Owned _____

Has the firm ever refused to sign a Contract at the original bid? _____

Has the firm ever defaulted on a Contract? _____

Has the firm ever been adjudged a bankrupt or been subject to a receivership or an order of reorganization? If so, give details and particulars _____

Is the business at this time subject to any court order relating to bankruptcy, receivership, liquidation or reorganization? _____

Does the bidder hold a current "DAS Contractor Prequalification Certificate" from the Connecticut Department of Administrative Services?

If so, what is the single project limit for which the bidder is so qualified? _____

If so, what is the contractor category or categories in which the bidder is so prequalified? _____

Is the bidder, or any affiliated entity, or principal stockholder or officer, indebted to the Town of Brookfield or to the Brookfield Water Pollution Control Authority on account of unpaid real or personal property taxes or on account of Sewer charges or assessments?

Financial Resources- Information relative to the firm's financial resources can and may be obtained from the following: (Give name, business and address).

Listing of current contracts of comparable size:

Name or Location	Value	Contact & Tel. No.
<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>

Upon request, the bidder will be expected to amplify the foregoing statements as necessary to satisfy the Owner concerning the ability to successfully perform the work in a satisfactory manner.

The undersigned hereby certifies that no person interested in this proposal is directly or indirectly interested in or connected with any other bid or proposal for said work, and no member of the Owner or other officer or employee of the Owner is directly or indirectly interested therein, or in any portion thereof.

The undersigned hereby certifies that this bid is genuine and not collusive or sham; that said bidder has not colluded, conspired, connived, or agreed, directly or indirectly, with any bidder or person, to put in a sham bid, or that such other person shall refrain from bidding, and has not in any manner, directly or indirectly sought by agreement or collusion, or communication or conference, with any person, to fix the bid price of any other bidder, or to fix any overhead profit or cost element of said bid price, or of that of any other bidder, or to secure any advantage against the Owner or any person interested in the proposed Contract; and that all statements contained in said proposal or bid are true; and further, that such bidder has not, directly or indirectly submitted this bid, or the contents thereof, or divulged information or data relative thereto to any association or to any member or agent thereof.

The undersigned hereby certifies that neither he nor his agent nor any other party for him has paid or agreed to pay, directly or indirectly, a person, firm or corporation any money or valuable consideration for assistance in procuring or attempting to procure the contract herein referred to, and further agrees that no such money or reward shall be hereafter paid.

Date _____

Firm Name:** _____

By: _____

Title _____

Address _____

Seal

**Insert Bidder's name

If corporation, give the State of Incorporation, using the phrase "A corporation organized under the laws of

If a partnership, give names of the partners, using also, the phrase "Co-partners trading and doing business under the firm name and style of _____

If an individual using a trade name, give individual name, using also the phrase "An individual doing business under the firm name and style of _____

BIDDER'S AFFIDAVIT
(This Affidavit is part of the Proposal)

State of _____ SS:
County of _____

By: _____

being duly sworn, deposes and says that he resides at _____

that he is the _____ of the _____
(Title) (Name of Bidder)

who signed the above Proposal, that he was duly authorized to sign and that the bid is the true offer of the Bidder; that the seal attached is the seal of the Bidder and that all the declarations and statements contained in the Proposal are true to the best of his knowledge and belief.

(/s/) _____

Subscribed and Sworn to before me this _____ day of _____, 20__

(SEAL)

Notary Public

My Commission Expires

**FORM OF
CONSENT OF SURETY/SURETY GUARANTY**

(To accompany Proposal)

KNOW ALL MEN BY THESE PRESENTS, that for and in consideration of the sum of \$1.00, lawful money of the United -States, the receipt whereof is hereby acknowledged, paid the undersigned corporation, and for other valuable consideration, the _____

(Name of Surety Company)

a corporation organized and existing under the laws of the State of _____

and licensed to do business in the State of Connecticut certifies and agrees, that if _____(Contract)

is awarded to _____

(Name of Bidder)

the undersigned corporation will execute the Performance and Payment bond or bonds as required by the Contract Documents and will become surety in the full amount of the Contract price for the faithful performance of the Contract and for payment of all persons supplying labor or furnishing materials in connection therewith.

(To be accompanied by the usual proof of authority of officers of surety company to execute the same).

BID BOND

KNOW ALL MEN BY THESE PRESENTS, That we, the undersigned _____ as principal; and _____ as Surety, are hereby held and firmly bound unto the _____ in the penal sum of \$_____ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this _____ day of _____ 20__

The condition of the above obligation is such that whereas the Principal has submitted to the owner as defined, a certain Bid, attached hereto, and hereby made a part hereof, to enter into a contract in writing, for

NOW, THEREFORE,

- (A) If said Bid shall be rejected, or, in the alternate
- (B) If said Bid shall be accepted and the Principal shall execute and deliver a contract in the form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said Contract, and for the payment of subcontractors, laborers and material men, shall in all other respects perform the Agreement created by the acceptance of said Bid.

Then, this obligation shall be void, otherwise the same shall remain in force, and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Principal may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have set their hands and seals, and such of them as are corporations having caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

Principal: _____ (L.S.)

Surety _____

By: _____

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

THAT _____, as Principal, hereinafter called Contractor, and _____ as Surety, are held and firmly bound unto the Brookfield Water Pollution Control Authority as Oblige, hereinafter called the Owner, in the amount of _____ Dollars (\$_____), for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated _____ entered into a contract with the Owner for the construction sanitary sewers entitled **Contract 2022-01 Brookfield Market Sewer Main Extension**, which contract with all its terms, covenants, conditions and stipulations is incorporated herein to form a part hereof as fully as if said contract was recited at length herein.

NOW, THEREFORE, the condition of this obligation is such that, if the Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

PROVIDED, that any alterations which may be made in the terms of the contract, or in the work to be done under it, or the giving by the Owner of any extension of time for the performance of the contract, of any other forbearance on the part of either the Owner or the Contractor to the other shall not in any way release the Contractor and the Surety, or their successors or assigns from their liability hereunder. Notice to the Surety of any such alterations, extension or forbearance is hereby expressly waived.

WHENEVER Contractor shall be, and declared by the Owner to be, in default under the Contract, the Owner having performed the Owners obligations thereunder, the Surety, upon written notice of such default, may promptly remedy the default or shall promptly:

1. Complete the Contract in accordance with its terms and conditions, by another contractor acceptable to the Owner, said other contractor to act as an agent of the Surety, or
2. Obtain a bid or bids for submission to the Owner for completing the Contract in accordance with its terms and conditions, and upon determination by the Owner and Surety of the lowest acceptable and responsible bidder, arrange for a contract between such bidder and the Owner, and make available as work progress sufficient funds to pay the cost of completion less the balance of the contract price (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph), but not exceeding, including other costs and demands for which the surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term, "balance of the contract price" as used in this paragraph shall mean the total amount payable by the Owner to the Contractor under the Contract and any amendments thereto, less the amount properly paid by the Owner to Contractor.

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several seals this _____ day of _____, 20____, the name and corporate seal of each corporate party being hereto affixed and these presents signed by its undersigned representative, pursuant to authority of its governing body.

IN THE PRESENCE OF:

_____ L.S.
(Principal) (Affix Seal)

By _____
(Title)

_____ L.S.
(Surety) (Affix Seal)

By _____
(Attorney-in-fact)

ACKNOWLEDGMENT OF PRINCIPAL

STATE OF _____)

) ss.: _____, 20__ COUNTY OF

_____)

Personally appeared _____ who acknowledged himself to be the _____ of _____ (Principal), that he knows the seal of said Corporation; that the seal affixed to said instrument is such Corporate Seal, that it was so affixed to the resolution of the Board of Directors of said Corporation, and that he, as such _____ being authorized to do so, executed the foregoing instrument for the purposes therein contained, by signing the name of the corporation by himself as _____.

In witness whereof I hereunto set my hand and seal.

Notary Public

ACKNOWLEDGMENT OF SURETY COMPANY

STATE OF _____)

) ss.: _____, 20__

COUNTY OF _____)

Personally appeared _____ who acknowledged himself to be the _____ of _____ (Surety), that he knows the seal of said Corporation; that the seal affixed to said instrument is such Corporate Seal, that it was so affixed to the resolution of the Board of Directors of said Corporation, and that he, as such _____ being authorized to do so, executed the foregoing instrument for the purposes therein contained, by signing the name of the corporation by himself as _____.

In witness whereof I hereunto set my hand and seal.

Notary Public

(The Surety company must append statement of its financial condition and a copy of the resolution authorizing the execution of Bonds by Officers of the company, and the power of attorney of the Surety company's attorney in fact, authorized to act within the State of Connecticut).

Affix Corporate Seal

LABOR AND MATERIAL PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS:

THAT, of _____ as Principal, and _____, of _____ as Surety are held and firmly bound unto the Brookfield Water Pollution Control Authority as Obligee (hereinafter called Owner) for the use and benefit of claimants as hereinbelow defined, in the amount of _____ (\$ _____), for the payment of which the Principal and Surety bind themselves, their heirs, executor, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has by written agreement dated _____, entered into a Contract with Owner for the construction sanitary sewers entitled **Contract 2022-01 Brookfield Market Sewer Main Extension**, which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

PROVIDED, that any alterations which may be made in the terms of the Contract or in the work to be done under it, or the giving by the Obligee of any extension of time for the performance of the contract, or any other forbearance on the part of either Obligee or the Principal to the other shall not in any way release the Principal and the Surety or either or any of them, their heirs, executors, administrators, successors or assigns from their liability hereunder, notice to the Surety of any alterations, extension, modification or forbearance of said Contract being hereby waived.

Any party, whether a subcontractor or otherwise, who furnished materials or supplies or performs labor or services in the prosecution of the work under said Contract, and who is not paid therefore, may assert a claim for payment or bring a suit on this Bond, and in the name of the person or party suing, prosecute the same to a final judgment, and

NOW, THEREFORE, the condition of this obligation is such that, if Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. A claimant is defined as a person or party having a direct contract with the Principal or with a subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.

2. The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished or provided by such claimant, may assert a claim for payment and prosecute a suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant.

a) Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two (2) of the Principal, the Owner, or the Surety, within ninety (90) days after claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was performed. Such notice shall be served by mailing the same by certified mail, postage prepaid, return receipt requested in an

envelope addressed to the Principal, Owner or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the State in which the aforesaid project is located.

b) After the expiration of one (1) year following the date on which Principal ceased Work on said Contract.

c) Other than in a state court of competent jurisdiction within and for the Judicial District in which the Project or Principal is located.

4. The amount of this bond shall be reduced by and to the extent of any payment of payments made in good faith thereunder, inclusive of the payment by Surety of mechanics liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several seals this _____ day of _____, 20__ the name and corporate seal of each corporate party being hereto affixed and these presents signed by its undersigned representative, pursuant to authority of its governing body.

IN THE PRESENCE OF:

_____	_____ L.S. (Principal) (Affix Seal)
_____	By _____ (Title)
_____	_____ L.S. (Surety) (Affix Seal)
_____	By _____ (Attorney-in —fact)

ACKNOWLEDGEMENT OF PRINCIPAL

STATE OF _____)
) ss.: _____, 20__
COUNTY OF _____)

Personally appeared _____ who acknowledged himself to be the _____ of _____ (Principal), that he knows the seal of said Corporation; that the seal affixed to said instrument is such Corporate Seal, that it was so affixed to the resolution of the Board of Directors of said Corporation, and that he, as such _____ being authorized to do so, executed the foregoing instrument for the purposes therein contained, by signing the name of the corporation by himself as _____.

In witness whereof I hereunto set my hand and seal.

Notary Public

ACKNOWLEDGEMENT OF SURETY COMPANY

STATE OF _____)
) ss.: _____, 20__
COUNTY OF _____)

Personally appeared _____ who acknowledged himself to be the _____ of _____ (Surety), that he knows the seal of said Corporation; that the seal affixed to said instrument is such Corporate Seal, that it was so affixed to the resolution of the Board of Directors of said Corporation, and that he, as such _____ being authorized to do so, executed the foregoing instrument for the purposes therein contained, by signing the name of the corporation by himself as _____.

In witness whereof I hereunto set my hand and seal.

Notary Public

(The Surety company must append statement of its financial condition and a copy of the resolution authorizing the execution of Bonds by Officers of the company, and the power of attorney of the Surety company's attorney in fact, authorized to act within the State of Connecticut).

Affix Corporate Seal

CONTRACT

CONTRACT

THIS AGREEMENT, made this _____ day of _____, 2022 by and between the Town of Brookfield WPCA, a municipal corporation located in State of Connecticut, acting by the Brookfield Water Pollution Control Authority, a duly authorized agency of said Town, party of the first part, hereinafter called the "Owner"; and

of _____ County of _____ State of _____, hereinafter called the "Contractor".

WITNESSETH; That for and in consideration of the payments and agreements to be made and performed by the Owner, the Contractor hereby agrees with the Owner to commence and complete the work described as "**Contract 2022-01, Brookfield Market Sewer Main Extension**" as shown in the Contract Documents prepared by Langan CT, Inc. The Contract Documents include the Contract Drawings, General Specifications, Contract Items, the Advertisement, Information for Bidders, Proposal, Bidder's Affidavit, General Conditions, this Contract, and all addenda thereto and modifications thereof, incorporated in the said Documents before execution of this Contract.

The Contractor hereby agrees to commence the work under this Contract within ten (10) days of receipt of a written notice to proceed from the Owner and to fully complete all work except maintenance and final pavement within 180 consecutive calendar days thereafter. The Contractor shall pay the Owner liquidated damages in the amount of \$500.00 for each calendar day that the Contractor shall exceed the foregoing contract period in completing the work.

The Owner will pay and the Contractor shall receive the Contract Price of _____
_____ dollars and _____ cents (in
words) (\$ _____), based upon the bid prices in the Bid Proposal, as full
compensation for:

- (a) Furnishing the security required for the faithful performance, and for the payment of all labor and material required under the Contract;
- (b) Performing and completing all work which is necessary or proper to be furnished and/or performed in order to complete the entire work as shown and described in the Contract Documents;
- (c) All losses or damages sustained by the Contractor:
 - (1) Arising out of the nature of the work aforesaid, or
 - (2) From the action of the elements, or
 - (3) From any unforeseen obstructions or difficulties encountered in the prosecution of the work, or
 - (4) From any encumbrances on the line of the work; and

- (d) All expenses incurred by or in consequence of the suspension or discontinuance of the work as specified.

The Owner shall pay the Contractor for performance of work in accordance with the unit prices or lump sums bid, and only for the work quantities actually required and performed. The Contractor will accept, as payment in full with no allowance for anticipated profit, the sum of:

- (a) The lump sum bid, less any approved credits for reduction in work;
- (b) The products of the quantities, as determined by the Engineer, multiplied by the unit prices bid or stipulated; and
- (c) Compensation for extra work, if any, as provided for in the General Conditions.

Such sum shall be subject to additions and deductions as provided in the Contract Documents, and shall be paid by the Owner to the Contractor in current funds, and only upon certificates of the Engineer, as provided in the General Conditions.

The Contractor represents and warrants:

- a) That the Contractor is financially solvent and experienced and competent to perform the contract work, and to furnish the labor, materials, supplies and equipment, to be so performed or furnished by the Contractor;
- b) That the Contractor is familiar with all federal, state, and municipal laws, ordinances, and regulations, which may in any way affect the work or those employed therein;
- c) That such temporary and permanent work required by the Contract Documents can be satisfactorily constructed and used for the purpose for which it is intended, and that such construction will not injure any person or damage any property; and
- d) That the Contractor will make no claims against the Owner if, in carrying out the project, the Contractor finds that the actual conditions encountered do not conform to the information shown in the Contract Documents, or to conditions to be expected from surface and/or subsurface indications and or investigations.

Liquidated Damages:

- A. The Owner and the Contractor recognize that "time is of the essence" on this project and that Owner will suffer financial loss apart from the costs described as Special Damages, if the Work is not complete within the time specified herein, plus any extensions allowed in accordance with the General Conditions. Owner and Contractor also recognize the delays, expense and difficulties involved in proving in a legal proceeding the actual loss or damages suffered to the Owner and/or its third party contract beneficiaries if the work is not complete on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay Owner \$500.00 for each day that expires after the time specified herein for completion including any extensions thereof made in accordance with the General Conditions, until the work is complete.

Special Damages:

- A. In addition to the amount provided for liquidated damages, Contractor shall pay Owner the actual costs reasonably incurred by Owner for engineering and inspection forces employed on the Work for each day that expires after the time specified herein for completion, including any extensions thereof made in accordance with the General Conditions, until the work is complete.
- B. After completion if Contractor shall neglect, refuse or fail to complete the remaining Work within the Contract Time, Contractor shall pay Owner the actual costs reasonably incurred by Owner for engineering and inspection forces employed on the work for each day that expires after the time specified herein for the Work to be completed and ready for final payment (adjusted for any extensions thereof made in accordance with the General Conditions) until the Work is completed and ready for final payment.

The Owner may deduct the amount of Liquidated Damages and Special Damages from monies due the Contractor under this Contract.

Thirty (30) days prior to mobilization or once all trades, materials, and services have been bought out (whichever is later), the contractor must submit its project-specific Affirmative Action Plan to the Commission on Human Rights and Opportunities.

This Contract shall bind the heirs, executors, administrators, successors and assigns of the respective parties hereto.

IN WITNESS WHEREOF, the parties to these presents have executed this Contract in four (4) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

(Seal)

Authority

Brookfield Water Pollution Control

ATTEST: _____

By: _____
Nelson Malwitz, Chairman

(Seal)

ATTEST: _____

(Contractor)

By: _____

(Title): _____

(Address): _____

NOTE: If Contractor is a Corporation,
Secretary should attest.

CONTRACT

THIS AGREEMENT, made this _____ day of _____, 2022 by and between the Town of Brookfield WPCA, a municipal corporation located in State of Connecticut, acting by the Brookfield Water Pollution Control Authority, a duly authorized agency of said Town, party of the first part, hereinafter called the "Owner"; and

of _____ County of _____ State of _____, hereinafter called the "Contractor".

WITNESSETH; That for and in consideration of the payments and agreements to be made and performed by the Owner, the Contractor hereby agrees with the Owner to commence and complete the work described as **"Contract 2022-01, Brookfield Market Sewer Main Extension"** as shown in the Contract Documents prepared by Langan CT, Inc. The Contract Documents include the Contract Drawings, General Specifications, Contract Items, the Advertisement, Information for Bidders, Proposal, Bidder's Affidavit, General Conditions, this Contract, and all addenda thereto and modifications thereof, incorporated in the said Documents before execution of this Contract.

The Contractor hereby agrees to commence the work under this Contract within ten (10) days of receipt of a written notice to proceed from the Owner and to fully complete all work except maintenance and final pavement within 180 consecutive calendar days thereafter. The Contractor shall pay the Owner liquidated damages in the amount of \$500.00 for each calendar day that the Contractor shall exceed the foregoing contract period in completing the work.

The Owner will pay and the Contractor shall receive the Contract Price of _____
_____ dollars and _____ cents (in
words) (\$ _____), based upon the bid prices in the Bid Proposal, as full
compensation for:

- (a) Furnishing the security required for the faithful performance, and for the payment of all labor and material required under the Contract;
- (b) Performing and completing all work which is necessary or proper to be furnished and/or performed in order to complete the entire work as shown and described in the Contract Documents;
- (c) All losses or damages sustained by the Contractor:
 - (1) Arising out of the nature of the work aforesaid, or
 - (2) From the action of the elements, or
 - (3) From any unforeseen obstructions or difficulties encountered in the prosecution of the work, or
 - (4) From any encumbrances on the line of the work; and

- (d) All expenses incurred by or in consequence of the suspension or discontinuance of the work as specified.

The Owner shall pay the Contractor for performance of work in accordance with the unit prices or lump sums bid, and only for the work quantities actually required and performed. The Contractor will accept, as payment in full with no allowance for anticipated profit, the sum of:

- (a) The lump sum bid, less any approved credits for reduction in work;
- (b) The products of the quantities, as determined by the Engineer, multiplied by the unit prices bid or stipulated; and
- (c) Compensation for extra work, if any, as provided for in the General Conditions.

Such sum shall be subject to additions and deductions as provided in the Contract Documents, and shall be paid by the Owner to the Contractor in current funds, and only upon certificates of the Engineer, as provided in the General Conditions.

The Contractor represents and warrants:

- a) That the Contractor is financially solvent and experienced and competent to perform the contract work, and to furnish the labor, materials, supplies and equipment, to be so performed or furnished by the Contractor;
- b) That the Contractor is familiar with all federal, state, and municipal laws, ordinances, and regulations, which may in any way affect the work or those employed therein;
- c) That such temporary and permanent work required by the Contract Documents can be satisfactorily constructed and used for the purpose for which it is intended, and that such construction will not injure any person or damage any property; and
- d) That the Contractor will make no claims against the Owner if, in carrying out the project, the Contractor finds that the actual conditions encountered do not conform to the information shown in the Contract Documents, or to conditions to be expected from surface and/or subsurface indications and or investigations.

Liquidated Damages:

- A. The Owner and the Contractor recognize that "time is of the essence" on this project and that Owner will suffer financial loss apart from the costs described as Special Damages, if the Work is not complete within the time specified herein, plus any extensions allowed in accordance with the General Conditions. Owner and Contractor also recognize the delays, expense and difficulties involved in proving in a legal proceeding the actual loss or damages suffered to the Owner and/or its third part contract beneficiaries if the work is not complete on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay Owner \$500.00 for each day that expires after the time specified herein for completion including any extensions thereof made in accordance with the General Conditions, until the work is complete.

Special Damages:

- A. In addition to the amount provided for liquidated damages, Contractor shall pay Owner the actual costs reasonably incurred by Owner for engineering and inspection forces employed on the Work for each day that expires after the time specified herein for completion, including any extensions thereof made in accordance with the General Conditions, until the work is complete.
- B. After completion if Contractor shall neglect, refuse or fail to complete the remaining Work within the Contract Time, Contractor shall pay Owner the actual costs reasonably incurred by Owner for engineering and inspection forces employed on the work for each day that expires after the time specified herein for the Work to be completed and ready for final payment (adjusted for any extensions thereof made in accordance with the General Conditions) until the Work is completed and ready for final payment.

The Owner may deduct the amount of Liquidated Damages and Special Damages from monies due the Contractor under this Contract.

This Contract shall bind the heirs, executors, administrators, successors and assigns of the respective parties hereto.

IN WITNESS WHEREOF, the parties to these presents have executed this Contract in four (4) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

(Seal)

Authority

Brookfield Water Pollution Control

ATTEST: _____

By: _____
Nelson Malwitz, Chairman

(Seal)

ATTEST: _____

(Contractor)

By: _____

(Title): _____

(Address): _____

NOTE: If Contractor is a Corporation,
Secretary should attest.

GENERAL CONDITIONS

GENERAL CONDITIONS

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GENERAL CONDITIONS

ART. 1 - DEFINITIONS

The term "Contract Documents" shall mean and consist of the Advertisement for Bids, Information for Bidders, Proposal, Bidder's Affidavit, executed Contract, General Conditions, General Specifications, Detailed Specifications, Contract Drawings entitled and all addenda thereto and modifications thereof incorporated in the Documents before execution of the Contract.

The term "Owner" shall mean the Brookfield Water Pollution Control Authority, Town of Brookfield, Connecticut, or its duly authorized representative.

The term "Engineer" shall mean Langan CT, Inc., 1 North Broadway – Suite 910, White Plains, New York 10601.

The Term "Contractor" shall mean the party or parties contracting with the Owner to perform a branch of the work herein specified or to the legal representative of such party or parties.

The term "Subcontractor" shall mean the party or parties having a contract or agreement with the Contractor to supply labor or materials, or both, for work at the site of the Project.

The term "Contract Bonds" shall mean the bonds furnished by the Contractor, as security for the faithful performance of his Contract and security for the payment of all persons performing labor or furnishing materials in connection therewith.

The term "Surety" shall mean the person, persons, or corporate body which is bound with and for the Contractor, and which binds itself or himself for the payment of all debts pertaining to, and for the acceptable performance of, the work for which he has contracted.

The term "Project" shall mean the entire work to be performed under the Contract.

The term "Work" or "work" shall mean all plant, labor, materials and supplies (including their transportation to or from the site of the Project by employees of the Contractor or his subcontractors), structures or parts thereof on which work is underway or completed, equipment, rentals, insurance, Contract Bonds, and other facilities and things agreed to be furnished and done by the Contractor, and necessary and proper for or incidental to the carrying out and completion of the terms of this Contract, including all shop and field tests of equipment and structures, operating tests and maintenance for one year.

The term "extra work" shall mean work authorized by the Owner which, by his written direction, involves changes in, or additions to, the work required under the Contract at the time of its execution.

The term "drawings" shall mean the Contract Drawings, all details or working drawings furnished by the Engineer pertinent or supplemental thereto, and such supplemental detail drawings as the Contract Documents may require the Contractor to furnish, when such drawings have been duly approved.

The term "specifications" shall mean the General Specifications, Detailed Specifications, specifications contained in the Contract Items or shown on the drawings, and standard specifications referred to herein.

The term "provide" and/or "furnish" shall mean to supply, deliver, place, install, connect, and make ready for use or for the purpose intended.

The term "completion" shall mean the full and exact compliance and conformance with the provisions and requirements expressed and implied by the drawings, specifications, and Contract Documents.

The term "material" (or "materials") shall mean all the things of any kind, nature, and class as may be specified which become a part of or are used in the construction of the work, together with all manufactured or prepared materials, articles, equipment, accessories, appliances, appurtenances, supplies and parts used therein or placed thereon.

The term "structures" shall mean manholes, conduits, pipe, electrical and other facilities, and other works which are to be built under this Contract or which may be encountered in the work and which are not otherwise classified herein.

The term "site" shall mean the area or areas which is the location for the performance of the work.

When referring to the work or its performance, the words "directed", "required", "permitted", "ordered", "designated", "prescribed", and others of like import, shall imply the direction, requirement, permission, order, designation or prescription of the Engineer; and "approved", "acceptable", "satisfactory", "in the judgment of", and words of like import shall mean approved by or acceptable to or satisfactory to the Engineer. Wherever in the specifications the words "detailed", "noted", "shown", or words of like import are used, it shall be understood that these words mean as detailed, noted, or shown on the drawings; and where the word "specified" is used, it shall be understood to mean as specified herein.

Whenever any article of equipment or material is specified by reference to the name of a manufacturer or dealer without the use of the terms "equal to", or "approved equal", the intent is to specify that equipment or material shall be the basis for the bid submitted in the proposal.

ART. 2 - HEADINGS

The headings of the articles herein are intended for convenience of reference only and shall not be considered as having any bearing on their interpretation.

ART. 3 - EXECUTION, CORRELATION AND INTENT OF DOCUMENTS

The Contract Documents shall be signed in quadruplicate by the Owner and the Contractor.

The Contract Documents are complementary, and what is called for by one shall be binding as if called for by all, The work herein described and/or shown on the drawings shall be complete in every detail notwithstanding that every item necessarily involved is or is not particularly mentioned or shown, and the Contractor will be held to provide all labor, materials, equipment and incidental accessories necessary for the entire completion of the work intended to be described or shown in finished form, tested and ready for operation, and shall not avail himself of any manifestly unintentional error or omission, should such exist.

Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and this Contract shall be read and enforced as though it were included herein, and if through mere mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party hereto, the Contract shall forthwith be physically amended to make such insertion.

If this Contract contains any unlawful provisions not an essential part of the general structure of the Contract and which shall not appear to have been a controlling or material inducement in the making thereof, the same shall be deemed of no effect and shall be deemed stricken from the Contract without affecting the binding force of the remainder.

ART. 4 -CONTRACT SECURITY

Simultaneously with delivery of the executed Contract, the Contractor shall furnish and deliver to the Owner in quadruplicate an executed Performance Bond and Labor and Material Payment Bond, each in the amount of one hundred percent (100%) of the accepted bid as security for the faithful performance of his Contract, and in the amount of one hundred percent (100%) of the accepted bid as security for the payment of all persons performing labor or furnishing materials in connection therewith, prepared in a form and having as security thereon such Surety or Sureties as are acceptable to the Owner, are authorized to transact business within this State, and have at least an A Minus rating from A.M. Best & Company. The bonds shall be purchased through a surety company having a local agent upon whom service of process can be made. The bonds shall assure the Owner coverage for a one year maintenance period subsequent to completion of work.

If, at any time after execution and approval of this Contract and the Bonds required by the Contract Documents, the Owner shall deem any of the Sureties upon such bonds to be unsatisfactory, or if, for any reason, such bonds shall cease to be adequate security for the Owner, the Contractor shall, within five (5) days after notice so to do, furnish new or additional bonds, in forms, sums and signed by such Sureties as shall be satisfactory to the Owner. No further payment shall be deemed due nor shall any further payment be made to the Contractor unless and until such new or additional bonds shall be furnished and approved. The premium on such bonds shall be paid by the Contractor.

ART. 5- BREAKDOWN STATEMENT OF LUMP SUM BIDS

Simultaneously with his delivery of the executed Contract, the Contractor shall furnish and deliver to the Owner triplicate copies of a breakdown statement of his lump sums bid in the Proposal, in such detail and form as will be acceptable to the Engineer, for use in preparing the monthly estimates. The breakdown shall show the delivered price of material and the allowance for installation, which may be enumerated in any monthly estimate for payment as provided here-in-under; and shall be so made as to facilitate the preparation of monthly estimates.

ART. 6- OBLIGATION OF CONTRACTOR

The Contractor shall, under the bid prices, furnish all labor, materials, plant, power, light, heat, fuel, water, tools, appliances, equipment, supplies, and any and all other means of construction necessary or proper for performing and completing the work; restore to their original condition all surfaces disturbed; do all work and pay all costs of cutting, fitting, patching, protecting, supporting, maintaining, repairing if damaged, relocating and restoring all surface, subsurface and overhead structures, and all other property, including the work of other contractors, and pipe, conduits, ducts, tubes, chambers, and appurtenances, public or private in the vicinity of the work; bear all costs of insurance; bear all losses due to the nature of the work and costs incidental to suspension or discontinuance of the work, except as herein provided; take all risks of whatever nature; indemnify the Owner for all claims, as herein provided; conform to all federal, state, county, or municipal legislation and requirements; undertake all cutting, fitting, or patching of his work required to bring it into conformity with the Contract Documents; leave intact the work of adjoining contractors, unless otherwise ordered; perform and complete the work, including all operating tests, to the satisfaction of the Engineer, and in the manner best calculated to promote rapid construction and consistent with safety of life and property, and in strict accordance with the Contract Documents; protect the work during construction; clean up the work during and after construction; and maintain it until final acceptance and as provided hereinafter under "Maintenance."

The Contractor will supervise and direct the work efficiently and with his best skill and attention. He will be solely responsible for the means, methods, techniques, sequences, safety measures, and procedures of construction. It is understood that neither the Owner nor the Engineer are responsible for the adequacy of construction methods or for the safety of Contractor's personnel. Neither the action nor

inaction of the Owner or the Engineer shall make them liable for injury or damage resulting from inadequate or improper construction methods.

The Contractor shall hold harmless, defend and indemnify the Owner, the Town of Brookfield and the Engineer, their agents, officers and employees, from and against any and all claims, damages, losses and expenses, including attorney's fees, arising out of the performance of this contract caused in whole or in part by any act or omission of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or for whose acts any of them may be liable except where such claim, damage, loss or expense is caused by the active and sole negligence or willful misconduct of such Owner, Town or Engineer.

It is intended that the unit prices and lump sum bids include all the work to be done which will result in a complete installation of first class workmanship and material ready for operation, and that any appurtenance, accessory, or work allied to any particular item of work and necessary for its proper operation or completion will be furnished and installed under the unit prices and lump sums or lump sum bid under this Contract.

ART. 7- START AND COMPLETION OF WORK

The Contractor shall commence work within ten (10) days from the date of receipt of a written notice from the Owner to commence work, and shall continue without interruption until work is completed, except as provided herein. The sequence of work shall conform to the construction program submitted by the Contractor and approved by the Engineer, provided however, that said schedule may be modified from time to time as directed or approved by the Engineer.

Modification of the schedule or sequence of construction by the Engineer shall not entitle the Contractor to extra compensation other than mobilization and demobilization costs, and only if such costs are in excess of normally anticipated costs as determined by the Engineer.

The Contractor shall complete the work in all respect, except for maintenance, within the number of consecutive calendar days stipulated in the Contract following the service of notice from the Owner to commence work.

ART. 8- CONTRACTOR'S AND SUBCONTRACTOR'S INSURANCE

The Contractor and each subcontractor shall carry and maintain at all times during the term of this Contract such insurance as hereafter specified as will protect such party, the Owner, the Town of Brookfield and the Engineer from claims for damages for bodily injury, including accidental or wrongful death, as well as claims for property damage, which may arise from operations under this Contract whether such operations be by such Contractor, by any subcontractor or by anyone directly or indirectly employed by such party. A subcontractor may be excused from coverage only if he is a named insured on the prime contractor's policy or policies.

The Contractor shall purchase and maintain such insurance with companies having a minimum A Minus rating from A.M. Best & Company, which are also satisfactory to the Owner.

The Owner, the Town of Brookfield and the Engineer, shall be named or endorsed as an Additional Insured on all policies of insurance except statutory Workers Compensation insurance. Each such policy shall waive right of recovery (waiver of subrogation) against the Owner, the Town of Brookfield and the Engineer.

The Contractor shall indemnify, save harmless and defend the Owner, the Town of Brookfield and the Engineer, their agents, officers and employees, from any and all claims and damages arising out of the performance of this Contract as more specifically provided in Article 6. The forms or amounts of insurance to be furnished by the Contractor and each subcontractor shall not operate to relieve or limit the liability of the Contractor or its subcontractors as otherwise set forth in the Contract Documents.

All of the insurance to be provided shall be considered to be primary and non-contributory insurance as respects the Owner, the Town of Brookfield and the Engineer.

The Contractor shall not commence work under this Contract until the Contractor has obtained all insurance required and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor has been obtained and approved. Notwithstanding the foregoing, the Owner's approval or failure to approve the insurance required hereunder shall not serve to relieve or decrease the liability of the Contractor for claims and damages arising out of the performance of this Contract by the Contractor or any of its subcontractors..

Prior to execution of the Contract, Contractor shall furnish the Owner with original Certificates of Insurance from the insurance carrier(s) in quadruplicate stating the type of coverage, the limits of liability and the expiration date for each policy. In addition, Contractor shall furnish the Owner with a copy of the Declarations and Endorsement Page(s) for the Commercial General Liability Policy listing all policy forms and endorsements. Owner's failure to obtain or approve the required documents prior to contract execution or commencement of the Work shall not waive Contractor's obligation to provide such documents. The Owner reserves the right to require Contractor to provide complete, certified copies of all insurance policies, including endorsements, required by this Article, at any time.

Each policy of insurance shall be endorsed to include a provision, and the certificate of insurance shall indicate, that the Owner will receive not less than 30 days written notice (10 days if cancelled due to non-payment) if the insurance is terminated or canceled prior to the expiration date of the policy.

The Contractor shall keep all of the required insurance in continuous effect during the life of the Contract and in the case of Products and Completed Operations coverage, for a period of three (3) years following acceptance of the Work. Renewal certificates covering the renewal of all policies expiring during the life of the Contract shall be filed with the Owner not less than 10 days before the expiration of such policies. In addition, if there is a cancellation of any insurance or a change to the limits of liability or coverage, the Contractor shall notify the Owner and the Engineer immediately and shall submit a new insurance certificate to the Owner and Engineer providing for replacement insurance. It is the responsibility of the Contractor to maintain evidence of current insurance coverage with the Owner for the duration of contract.

The amounts of insurance coverage required hereunder may be provided under a combination of primary and excess (umbrella) policies.

The Contractor and each sub-contractor shall carry and maintain at all times during the term of this Contract the following insurance coverages:

1. **Workers' Compensation Insurance:** With respect to all operations the Contractor performs and all those performed for it by subcontractors, the Contractor shall carry, and require each subcontractor to carry, Workers' Compensation insurance as required by the laws of the State of Connecticut. Such insurance shall be provided in amounts not less than \$100,000 per accident for bodily injury by accident; \$100,000 policy limit by disease and \$100,000 per employee for bodily injury by disease, or such higher amounts as may be required by State law.

2. **Commercial General Liability Insurance:** With respect to the operations the Contractor performs, the Contractor shall carry, and require each subcontractor to carry, Commercial General Liability insurance, including Contractual Liability, Products and Completed Operations, Broad Form Property Damage and Independent Contractors coverages.

Coverage shall be on an “occurrence” basis.

Each such policy shall have coverage for and exclusions removed for “Explosion, Collapse and Underground” (“XCU”).

Coverage shall include contingent liability coverage to protect the Contractor and Owner, Town of Brookfield and Engineer as Additional Insureds against claims arising from the operation of Subcontractors. Such coverage may be provided as to subcontractors by Endorsement CG 20 38 04 13 Additional Insured – Owners, Lessees or Contractors – Automatic Status For Other Parties When Required In Written Construction Agreement, or equivalent. This coverage may be waived if there will be no subcontractors on the project.

Products and Completed Operations insurance for ongoing and completed operations shall be maintained for a period of not less than three (3) years following the acceptance of the Work. If such coverage is not furnished initially, it must be provided by the furnishing of a separate site specific policy of insurance prior to acceptance of the Work and semi-final payment by the Owner as provided for in Articles 100 and 101.

Such insurance shall fully insure against the Contractor’s (or subcontractor’s) liability for bodily injury and property damage with combined bodily injury (including death) and property damage minimum limits of

\$5,000,000 per occurrence / all insured limit
\$2,000,000 personal injury and advertising injury limit
\$5,000,000 completed operations aggregate / all insured

The aggregate limits must apply solely to this Work and Project and Endorsement CG 25 03 03 97 Designated Construction Project(s) General Aggregate Limit or equivalent must be endorsed to the policy.

3. **Automobile Liability Insurance:** The Contractor shall carry, and require each subcontractor to carry, automobile liability insurance covering the operation of all motor vehicles, including those hired or borrowed, that are used in connection with the Project for all damages arising out of: (a) bodily injury to or death of all persons and/or (b) injury to or destruction of property in any one accident or occurrence.

Such policy shall have a minimum combined limit for bodily injury (including death) and property damage of \$5,000,000. No aggregate limitation shall be permitted.

4. **Builder’s Risk Insurance:** If this Project involves the construction of any structure or building requiring issuance of a building permit or a certificate of occupancy (C.O.) or a certificate of compliance (C.O.C.) by the Building Official following completion, then in such event, the Contractor shall procure and maintain during the life of the Contract, Builder’s Risk (Completed Value) insurance providing coverage for that portion of the Work involving such construction, including all fixtures, machinery and equipment to be included within such structure or building and including, any heating, cooling or equipment constituting a permanent part of such structure or building and shall cover portions of work located away from the site, but intended for use at the site of such construction.. The insurance shall be written on a broad all risks of

loss policy form including without limitation collapse, flood, earth movement in an amount equal to 100% of the "completed value" of such structure or building. The Engineer shall determine the "completed value" of the work to be protected by such insurance based upon the Project bid or the Engineer's reasonable cost estimate, whichever is higher. The Owner shall be named as Loss Payee.

ART. 9- CONSTRUCTION PROGRAM

Following award of his Contract, the Contractor shall attend a Project conference arranged by the Owner which will include representatives of the Owner, the Engineer, and all other contractors doing work on or about the site.

Within 10 days after notice to proceed with the work, the Contractor shall prepare and submit for approval six copies of a detailed chronological construction program or work progress schedule, setting forth clearly each stage including approximate delivery dates of materials, and the time allowed for the installation of materials, in order to complete all the work fully within the time fixed herein, and, if required, he shall revise and resubmit the program until it is approved. Confirmed delivery dates for materials shall be furnished as soon as practicable after the submission of the construction program.

The Critical Path Method will be permissible in preparation of the construction program, which must be adjusted and updated through a monthly narrative submission.

The Contractor, within 7 days after being notified of an unsatisfactory program, shall resubmit a revised program for approval. If, subsequent to the initial approval, unforeseen circumstances necessitate a modification of the approved construction program, as determined by the Engineer, the Contractor, within 7 days after such notification, shall submit a revised program for approval.

The Contractor shall adhere to such program, and, if necessary to do so, he shall supply, without increased cost to the Owner, additional labor and/or additional shifts of labor and overtime, and procure materials and equipment more promptly.

The Engineer shall have the right to order the Contractor to prosecute the work simultaneously at and from as many different points or parts as the Engineer may deem necessary to assure completion within the Contract time, or to assure minimum interference with the public. Failure to comply with any such work order shall constitute a breach hereof.

The Contractor shall also submit, with such construction program, his plans for plant and his specifications covering methods of construction and of handling materials which he proposes to use in the performance of work. Approval, however, of any proposed plans of plant and such specifications shall not be deemed to relieve the Contractor of any liability or responsibility placed upon him by this Contract or by law.

ART. 10- NOT USED

ART. 11- ACCEPTANCE OF DRAWINGS AND SPECIFICATIONS

The Contractor admits and agrees that he is satisfied with the drawings and specifications and agrees that he will at no time dispute or complain that there was any misunderstanding or any error in regard to the amount, quantities, materials to be furnished, and of the work to be done under this Contract, or in regard to the amount of compensation to be paid therefore; and he further covenants and agrees to completely execute and perform his Contract and to fully complete the said work or improvements to the satisfaction of the Owner and to strictly comply with these drawings and specifications and not to ask or demand, sue for or recover any further or extra compensation beyond the Contract price. He also further covenants and agrees that the Owner may accept any alternate listed at the time of submitting his proposal for the price set therein during the life of the Contract. It is intended that all said prices shall be the sole

and only compensation to the contractor for the full and complete performance of this contract, and the full completion of said Contract or improvement. It is also understood and agreed that the price to be paid includes payment for all labor, materials, tools, equipment and permits therefor.

The Contractor accepts the drawings and specifications as complete and accurate and agrees that there is no conflict therein with permissible trade practices or methods. Any objections to the drawings and specifications that the Contractor may have must be called to the Engineer's attention and the matter resolved before submitting his Proposal.

The Contractor agrees that should there be conflicts or objections not called to the Engineer's attention and written decision rendered by the Engineer before signing the Contract the Engineer's decision with regard to such conflict or objection shall be final and binding on the Contractor.

ART. 12 - OMISSION OF DETAILS IN DRAWINGS AND SPECIFICATIONS

All work called for in the specifications applicable to each separate Contract, but not shown on the drawings in their present form, or vice versa, and work not specified in either the drawings or in the specifications, but involved in carrying out their intent, or in the complete and proper execution of the work, shall be performed by the Contractor as though it were specifically delineated or described.

The apparent silence of the specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only the best material and workmanship is to be used; and interpretation of these specifications shall be made upon that basis.

ART. 13 - CONFLICTS ON DRAWINGS AND SPECIFICATIONS

In case of any conflict or inconsistency between the drawings and specifications, the matter shall be submitted by the Contractor to the Engineer, whose decision thereon shall be conclusive and binding on the Contractor as if same were specifically set forth in the Contract, and unless he shall have asked for and obtained a decision in writing from the Engineer before submitting his Proposal as to what shall govern, the Contractor shall be deemed to have estimated on the more expensive way of doing the work.

Any discrepancy between the figures on drawings shall be submitted by the Contractor to the Engineer, whose decisions thereon shall be conclusive and final.

When any detail of construction is not fully understood by the Contractor, he shall make application to the Engineer for such additional instructions as may be necessary and the Engineer's decision shall be final. In no case shall he proceed without such instructions.

Should anything be omitted from the drawings or specifications which is necessary to a clear understanding of the work, or should any errors appear either in any of the drawings furnished or in the work done by other contractors affecting the work included under this Contract, the Contractor shall promptly notify the Engineer of such omission or errors and in event of the Contractor's failure to do so, he shall make good any damages to or defect in his work caused thereby. He will not be allowed to take advantage of any error or omission on the drawings, as full instructions will be furnished by the Engineer, should such error or omission be discovered, and the Contractor shall carry out such instructions as if originally specified.

Errors in the specifications and/or drawings which are purely typographical shall be interpreted as would be the logical conclusion or brought to the attention of the Engineer for interpretation.

The Contractor is required to check all dimensions and quantities on the drawings or schedules given to him by the Engineer, and shall notify the Engineer of all errors therein which he may discover by

such examination and checking. The Contractor will not be allowed any extra payment for work he alleges to be due to any error or omission in these specifications, nor in the drawings or schedules, as full directions will be furnished by the Engineer should such error or omission be discovered, and the Contractor shall carry out such instructions as if originally specified.

Figured dimensions on drawings shall take precedence over measurement by scale and detailed working drawings shall take precedence over general drawings and shall be considered as explanatory of them and not as indicating extra work.

ART. 14- DRAWINGS, DIAGRAMMATIC REPRESENTATION

Where drawings are shown in diagrammatic form they are intended to convey scope of work and to indicate general arrangement of equipment, ducts, conduits, piping and fixtures.

Locations of all items, shown on drawings or called for in specifications that are not definitely fixed by dimensions are approximate only. Exact locations necessary to secure the best conditions and results shall be submitted to the Engineer for approval before installation.

When directed by the Engineer, reasonable modifications in layout shall be made as required to prevent conflict with work of other trades or for proper execution of work, without additional cost to the Owner.

ART. 15- STANDARD SPECIFICATIONS AND ABBREVIATION

Where reference is made in the Contract Documents to the standard specifications of any technical society, Federal Specification Board, or other recognized organization, these shall be construed to mean the latest standard adopted and published at the date of advertisement for bids and such specifications are made part hereof to the extent which is indicated.

The following abbreviations are used throughout the specifications to refer to organizations publishing specifications that are widely accepted as standards:

AASHTO	American Association of State Highway and Transportation Officials
ACI -	American Concrete Institute
AGA -	American Gas Association
AGMA -	American Gear Manufacturers Association
AHDGA-	American Hot Dip Galvanizing Association
AIEE -	American Institute of Electrical Engineers
AISC -	American Institute of Steel Construction
AISI -	American Iron and Steel Institute
AMCA -	Air Moving and Conditioning Association
ANSI -	American National Standards Institute
ASCE -	American Society of Civil Engineers
ASHRAE-	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME -	American Society of Mechanical Engineers
ASTM -	American Society for Testing and Materials
AWPA -	American Wood Preservers' Association
AWS -	American Welding Society
AWWA -	American Water Works Association
F.S. -	Federal Specifications
IBR -	Institute of Boiler and Radiator Manufacturers
IEEE -	Institute of Electrical and Electronic Engineers
IPCEA-	Insulated Power Cable Engineers Association
NBFU -	National Board of Fire Underwriters (American Insurance Association)

NEC -	National Electrical Code
NEMA -	National Electrical Manufacturer's Association
SBI -	Steel Boiler Institute
SSPC -	Steel Structures Painting Council
UL -	Underwriters Laboratories, Inc.

ART. 16 - DATUM

The figures given in the Contract and specifications or upon the Contract Drawings after the word "elevation" or an abbreviation of it, shall mean distance in feet above United States Coast and Geodetic Survey Datum, for mean sea level.

ART. 17- DRAWINGS AND SPECIFICATIONS TO BE FURNISHED TO CONTRACTOR

The Contractor will be furnished with four white prints on paper, of each of the numbered drawings and a title sheet, and four sets of specifications. Additional prints and specifications will be furnished the Contractor upon application, at cost of reproduction.

Where a revision of a drawing becomes necessary, four copies of only the revised drawing will be furnished to the Contractor for inclusion with the previously issued drawings.

Supplementary drawings will be issued by the Engineer to the Contractor from time to time, where the Contract Drawings require supplementing, to explain the work more fully or to show changes which have been ordered by the Owner. Four white prints on paper, of each supplementary drawing will be furnished to the Contractor. These supplementary drawings shall have the same force and effect as any other Contract Documents.

The Contractor shall keep one (1) copy of all drawings and specifications including the latest revised drawings and supplementary drawings, at the job site, in good legible condition, available to the Engineer and to his representatives.

ART 18 – RE-USE OF DRAWINGS AND SPECIFICATIONS

All drawings, specifications and copies thereof furnished by the Engineer are not to be used on any other work.

ART 19 - ENGINEERING REPRESENTATION

During the life of the Contract, there will be representation by the Engineer and his authorized agents who will define the meaning and intent of the drawings and specifications, pass upon materials and workmanship, and determine that the work is proceeding in accordance with the Contract Documents. He may reject such work as in his opinion is not in accordance with the drawings and specifications.

The Engineer's representation is for the purpose of assuring that the work described by the drawings and specifications is being properly executed. If an Engineer's field representative is employed he shall act as the Engineer's agent, serve as liaison between the Engineer and the Contractor generally through the Contractor's field superintendent, conduct on-site observations and keep records of the work in progress, give assistance in interpreting the drawings and specifications, transmit orders by the Engineer to the Contractor, review applications by the Contractor for payment, conduct final inspection of the work in the company of the Engineer and the Owner and perform other field representative duties as required.

Neither the Engineer, his field representative, or other authorized agents shall authorize any deviation from the Contract Documents without the knowledge and consent of the Owner, nor undertake any of the responsibilities of the Contractor, his subcontractors, or his field superintendent, nor expedite or superintend the Contractor's work, nor advise on or issue directions relative to any aspect of

construction technique or method unless such technique or method is called for in the drawings and specifications.

The Engineer and his authorized agents shall have authority to stop the work of the Contractor whenever such stoppage is necessary to insure compliance with the Contract Documents.

The Engineer shall judge as to what constitutes a reasonable notice, and whether or not workmanship or materials incorporated in the work meet the standards and intent of the drawings and specifications, or of the kind of quality of materials that must be submitted to the Engineer for approval. His decision as to these questions must be accepted as final.

ART. 20 - INSPECTION

The Engineer, his authorized agents, or the Owner will inspect materials furnished and the work done under this Contract, and he is also hereby authorized and empowered to reject and refuse all work; materials and equipment, and the method of application of any part thereof, under or in fulfillment of this Contract, that does not comply in kind, quality, quantity, time, place or performance, with the specifications and the drawings. The inspection, approval or acceptance of any part of the work herein contracted for, or the materials used therein, or any payment on account thereof, shall not prevent the rejection of said work or materials at any time thereafter during the existence of this Contract and prior to the final payment should said work or materials be found to be defective or not in accordance with the requirements of the drawings and specifications.

Inspection, test, or acceptance of any materials prior to shipment shall not be deemed as a final acceptance of the materials. The Engineer may inspect or require tests or analyses of any portion of the materials at any time, after delivery at the site of work, either before or after installation, and any material which is found to be defective or which does not otherwise conform to the requirements of the specifications shall be rejected and removed forthwith from the site of the work, as provided in the Contract.

The Contractor will be required to pay for all costs of engineering field work and inspection which is:

- (a) Performed on Saturdays, Sundays, or legal holidays, and which is made necessary by the Contractor's operations on such days and
- (b) Performed between the completion date specified and the actual completion of the Contract, regardless of whether or not an extension of time may be approved.

ART. 21 - ACCESS TO WORK

Agents, authorized representatives, and employees of participating Federal Agencies, the State, the Owner, and the Engineer, shall for any purpose have access to the work and the premises used by the Contractor, and the Contractor shall provide safe and proper facilities therefor, including ladders and scaffolds. Other parties who may enter into contracts with the Owner for doing work within the territory covered by this Contract, shall, for all purposes which may be required by their contracts, be accorded the rights of access to the site of those parts of the work for which they are under contract.

Furthermore, the said agencies, the Owner, the Engineer, and their inspectors and agents shall, at all times, have immediate access to all places of manufacture where materials are being made for use under this Contract and the Contractor shall provide full facilities for determining that all such materials are being made strictly in accordance with the specifications and drawings. Records of payrolls, personnel, invoices, bills of lading and other relevant data shall also be made available by the Contractor for inspection upon request.

ART. 22 - PERSONAL LIABILITY

In carrying out the provisions of this Contract or in exercising any power or authority granted them by their position there shall be no liability upon the appointed officials, the Engineer or their authorized representatives or assistants, either personally or as officials of the Owner, it being understood that in such matters they act as agents and representatives of the Owner.

ART 23 - TESTING OF MATERIALS

If the Engineer so requires, either prior to, beginning, or during the progress of the work, the Contractor shall submit samples of materials for such special tests and analyses as may be necessary to demonstrate that they conform to the specifications. The Owner will select and pay for testing laboratories to perform tests and analyses on concrete aggregates, mixed and placed concrete and similar materials. Such samples shall be furnished, taken, stored, packed, and shipped as directed at the expense of the Contractor.

The Contractor shall submit data and samples, or place his orders, sufficiently early to permit consideration, inspection, testing, and approval before the materials and equipment are necessary for incorporation in the work. Any delays resulting from his failure so to do shall not be used as a basis of a claim against the Owner or the Engineer.

If the Engineer orders sampling and analyses or tests of materials which are usually accepted on certification of the manufacturer but which appear defective or not conforming to the requirements of the specifications, the Owner will bear the costs of tests and analyses if material is found to be sound and conforming to the specifications; if found defective or not conforming to the specifications, the Contractor shall bear all of the costs.

ART. 24 - CERTIFICATES OF MANUFACTURERS

For pipe, cement, steel reinforcement, paint and similar materials which are normally tested in the shop by the manufacturer, the Contractor shall furnish the Engineer certified records of physical, chemical, and other pertinent tests, and/or certified statements from the manufacturer that the materials have been manufactured and tested in conformity with the specifications. Where such a small quantity of material is required as to make physical tests or chemical analyses impractical, a certificate from the manufacturer stating the results of such tests or analyses of similar materials which were concurrently produced, may at the discretion of the Engineer, be considered as the basis for the acceptance of such materials.

ART. 25 - DEFECTIVE WORK OR MATERIALS

The inspection of the work by the Engineer or Owner shall not relieve the Contractor of any of his obligations to fulfill his Contract as herein prescribed and defective work shall be made good, and unsuitable materials may be rejected, notwithstanding that such work and materials may have been previously inspected by the Engineer or Owner and accepted or estimated for payment.

If at any time before the final acceptance of the work, materials or workmanship should be discovered which do not comply with the specifications and drawings, they shall be immediately removed by the Contractor when notified to do so by written notice from the Engineer or Owner and shall be replaced at the Contractor's expense. Any work rejected by the Engineer or Owner as unsuitable or improperly done shall be removed and repaired, or otherwise remedied, as the Engineer or Owner may direct.

Any material rejected by the Engineer or Owner shall be removed from the site of the work within two days if and after notice to that effect is given.

Should defective work be suspected and the Engineer or Owner so require, the Contractor shall uncover, take down or make openings in the finished work for the purpose of examining at such points as said Engineer or Owner designates.

Should the work thus exposed or examined prove satisfactory, the uncovering, taking down or making openings in and replacing of the covering or the making good of the parts removed shall be paid for in accordance with the contract unit prices and/or as provided hereinafter under "Extra Work and Changes in the Work", for the items involved; but should the work exposed or examined prove unsatisfactory, the uncovering, taking down, replacing and making good shall be at the expense of the Contractor. However in no event shall the Owner pay for any costs of uncovering and covering work where the Contractor has covered the work without its being inspected by the Owner or the Engineer.

If the Contractor shall fail or neglect to replace any defective work or to discard rejected materials within 10 days after the service by the Engineer of an order to replace such defective work or discard such materials, or to prove to the satisfaction of the Owner that he is initiating effective efforts to replace defective materials, the Owner may cause such defective work or materials to be replaced or removed, and acceptable materials provided, and the expense thereof shall be deducted from the moneys as are or may become due under this Contract, or if such moneys are not sufficient to meet said expense the additional moneys shall be furnished by the Contractor or his Surety. If during the maintenance period provided for hereinafter, any work done in accordance with that article shall be found defective before the end of the maintenance period; such defective work shall be made good in the same manner as provided herein. The Owner will have the option at all times to allow the defective or improper work to stand and to accept an equitable deduction from the Contract Price therefor.

ART. 26 - WEIGHING AND MEASURING

Whenever requested by the Engineer, the Contractor shall provide personnel and all required weighing and measuring devices for determining the quantity of materials. For estimating quantities in which the computation of areas by geometric methods would, in the opinion of the Engineer, be comparatively laborious, it is stipulated and agreed that the planimeter shall be considered an instrument of precision adaptable to the measurements of such areas.

ART. 27 - DRAWING AND PRINTED MATTER FURNISHED BY THE CONTRACTOR

After approval of the list of manufacturers, the Contractor shall submit for approval, working drawings and shop drawings and descriptions of all materials and equipment which he is to furnish such as steel reinforcement, structural details, layout and support of sheeting and bracing, wiring, and details of supporting and relocating utilities or other adjacent structures, if he intends to deviate from the details shown or if the details are not shown. The Contractor, on approval of the Engineer, may submit manufacturers' literature as a substitute for, or supplement to, the shop drawings. The minimum size for any submission shall be 8 1/2 inches by 11 inches. All drawings and printed matter submitted shall clearly indicate the section of the Contract Items to which they correspond (e.g. G 2.08). Erection drawings may also be required.

Drawings or printed matter shall give all dimensions and sizes to enable the Engineer to consider the suitability of the material or layout for the purpose intended. The working drawings shall, where needed for clarity, include outline and sectional views, and detailed working dimensions and designations of the kind of materials and the kind of machine work and finish required. Drawings for submission shall be coordinated by the Contractor with the drawings heretofore approved, and with the design and function of any equipment or structure. All measurements shall be field checked by the Contractor, who shall not rely on the contract drawings for any dimension that can be measured in the field.

Material shall not be purchased or fabricated for equipment or structures until the Engineer has reviewed the working drawings, which shall represent all materials and work involved in the construction. No materials or equipment shall be delivered to the site until working drawings have been reviewed.

Work shall not be done upon any part of a structure, the design or construction of which is dependent upon the design of equipment or other features, until a review has been made by the Engineer.

Six copies of drawings and printed matter shall be submitted to the Engineer for review. Upon review by the Engineer, the Contractor shall furnish the Engineer with four prints on paper of each approved drawing, and four copies of approved manufacturer's printed literature. Only drawings which have been checked and corrected by the material fabricator shall be submitted. The Contractor shall be responsible for the prompt submission of all working drawings, so that there shall be no delay in the work due to the absence of such drawings.

All shop drawings submitted must bear the approval stamp of the Contractor as evidence that the drawings have been first checked by the Contractor. Any drawings submitted without this stamp of approval will not be considered and will be returned to the Contractor for resubmission. If the shop drawings show variations from the requirements of the Contract Documents because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in his letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment; otherwise the Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract Documents even though such shop drawings have been reviewed.

Where a shop drawing as submitted by the Contractor indicates a departure from the Contract, which the Engineer deems to be a minor adjustment, in the interest of the Owner not involving a change in Contract price or extension of time, the Engineer will review the drawing but such review implies the following:

"The modification shown on the attached drawing has been reviewed in the interest of the Owner to effect an improvement for the Project and is accepted with the understanding that it is subject generally to all Contract stipulations and covenants; and that it is without prejudice to any and all rights of the Owner under the Contract and bond or bonds."

Where additional working drawings are required, the Contractor shall submit same upon the request by the Engineer.

Any review or lack of same by the Engineer of such working drawings, manufacturer's literature or other data related to the work or material to be furnished for the Contract shall not be construed as in any way relieving the Contractor from his full responsibilities under the terms of the contract.

ART. 28 – NOT USED

ART. 29 - PATENTS AND ROYALTIES

The Contractor shall indemnify and save harmless the Owner and his officers and agents, from all damages, judgment, claims and expenses arising from the infringement of any letters of patent, or patent right or because of any royalty, fee or license for the use, arrangement or operation of any tools, machinery, appliances, devices, materials, process or processes which may be used by the Contractor or furnished by him in fulfillment of the requirements of this Contract. In the event of any claim or action at law on account of such patents or fees, it is agreed that the Owner may retain out of moneys which are or which may become due the Contractor under this Contract, a sum of money sufficient to protect himself against loss, and to retain the same until said claims are paid or satisfactorily adjusted.

ART. 30 - DESIGN OF EQUIPMENT

All parts of the equipment furnished under the Contract shall be amply proportioned for all stresses that may occur during fabrication, shipment, erection, and intermittent or continuous operation. Identical parts shall be interchangeable.

The equipment to be furnished under the Contract shall be of an approved type, and the product of manufacturers who have successfully built equipment of the same size, capacity, and type for at least 5 years unless otherwise specified. The Contractor shall submit any information that the Engineer may consider necessary in order to determine the ability of the manufacturer to produce the equipment as called for by the specifications.

Unless other specific requirements are noted under the Contract Items, the Contractor shall provide the services of an accredited representative of the manufacturer to supervise the installation, testing and placing of equipment in satisfactory operation. This representative shall also make final adjustments and shall instruct designated employees of the Owner in the proper operation and maintenance of the equipment.

The Contractor shall obtain from each manufacturer a warranty for equipment replacement and repair in the event of malfunction, which shall extend for one year from the date of "acceptance of the work".

The minimum manufacturing experience requirement is for five years, as specified herein. In other sections of the Contract Documents, manufacturers are required to "have regularly engaged in the manufacture and installation of comparable systems". In all such cases, consideration will be given to alternative equipment which does not meet the specified experience period if the equipment supplier or manufacturer provides a bond from acceptable surety, or a cash deposit, for the value of the equipment being supplied, plus installation costs, removal costs, overhead and profit. The bond or deposit shall be maintained for a period of time equal to the experience period specified and must be available as a guarantee for replacement within thirty days after declaration by the Engineer that the alternative equipment has failed to meet with specified requirements. All such alternative equipment must be submitted to the Engineer for review so as to assure that all technical requirements are met.

The manufacturer's nameplate, name or trademark shall be permanently affixed to all equipment and material furnished. Nameplate of subcontractor or distributor will not be acceptable.

The Contractor shall furnish and install identifying tags and nameplates on all equipment, valves, ducts, dampers, motors, heating and ventilating and electrical work, bearing name and number indicated on the drawings and the function. Unless otherwise specified, tags shall be Seton Name Plate Co. aluminum type with black enamel background and etched or engraved aluminum lettering, or laminated Bakelite or Lamicold.

Nameplates shall be secured with screws, or nuts and bolts where possible, or wired securely elsewhere. The Contractor shall furnish four copies of a list of all nameplates and their location.

ART. 31 - GREASE FITTINGS AND LUBRICATION

The Contractor shall ensure that all grease fittings on each piece of equipment furnished under the Contract are standardized so that only the "Alemite" button-head type of fitting is utilized, except as otherwise specified or required. Fittings shall be standard or giant size according to the type of service performed.

The Contractor shall furnish and use, for each piece of equipment, the type of lubricant recommended by the manufacturer of the equipment. He shall furnish a schedule, in triplicate, listing the

type, frequency of application, and manufacturer of the lubricant recommended for each piece of equipment. At the time of turning the installation over to the Owner, the Contractor shall furnish one year's supply of each type of lubricant in unopened containers.

ART. 32 - SPARE PARTS, SERVICING TOOLS, MANUALS AND PARTS LISTS

Each piece of equipment shall be furnished with a dozen lot assortment of keys, bolts, nuts, lock washers and pins, in tagged sacks. Each piece of equipment having shear pins shall be furnished with two dozen shear pins of each size used, in tagged sacks. Each piece of equipment having leather or rubber washers shall be furnished with two extra washers of each size and material required.

The Contractor shall furnish, with each piece of equipment, the complete set of tools including three sets of spare bulbs and fuses normally furnished by the manufacturer for the servicing of the equipment.

Each major piece of equipment shall be furnished with the spare parts listed in the specifications for the equipment or, if no such list is provided, with the standard set of spare parts recommended by the manufacturer of the equipment. The recommended list of spare parts shall be submitted to the Engineer prior to the delivery of the equipment.

All spare parts shall be plainly tagged and marked for identification and ordering. They shall be treated with suitable preservatives, wrapped and packaged to provide adequate protection during storage.

The Contractor shall furnish and deliver to the Engineer, prior to the installation of any piece of equipment, three complete neatly bound sets of instruction books or trade literature for such equipment to enable the operator to understand the mechanism and its maintenance. Automatic control diagrams and complete numbered parts lists shall be supplied with the instruction books. The books shall contain clear and concise instruction for operation, adjustment, lubrication (including a lubrication chart) and maintenance of the equipment.

The Contractor shall furnish three sets of parts drawings of all equipment, including minor parts and sub-assemblies, in such detail as will permit disassembly and assembly of the equipment.

The list of all parts for the equipment, shall have the part or catalog number, name of actual manufacturer as well as supplier and other data necessary for ordering replacement parts. Part or catalog number shall be listed according to both supplier and actual manufacturer.

Such instructions and parts lists have been prepared for the specific equipment furnished and shall not refer to other sizes and types or models of similar equipment.

ART. 33 - NOTICES TO CONTRACTOR

The residence or place of business given in the bid or proposal upon which this Contract is founded, is hereby designated as the place where all notices, letters and other communications shall be served, mailed to, or delivered. Any notice, letter or other communication addressed to the Contractor and delivered at the above named place or deposited in a prepaid wrapper in any post office box regularly maintained by the United States Post Office Department shall be deemed sufficient service thereof upon the Contractor, and the date of mailing shall be the date of service. The place name may be changed at any time by an instrument in writing, executed and acknowledged by the Contractor and delivered to the Engineer. Nothing herein contained shall be deemed to preclude or render inoperative the service of any notice, letter or other communication upon the Contractor personally.

ART. 34 - RESPONSIBILITY OF CONTRACTOR

The Contractor shall take all responsibility of the work, shall bear all losses resulting to him on account of the amount or character of work, or from any unforeseen obstructions, encumbrances, or difficulties which may be encountered, or from the breaking of or leakage from any pipe, water mains or sewers, or because the nature of the land in or on which the work is done is different from what is assumed, or on account of the weather, floods or other causes, or from delayed deliveries of equipment required for any related or adjoining contract, or from damage or injury from any cause to property or persons used or employed on or in connection with the work; and he shall assume the defense of and indemnify and save harmless the Owner and its officers, and agents, from all claims of any kind arising from the performance of this Contract, except claims for injuries to or death of employees of the Owner, which injury or death is not due to negligence of, or breach of contract by, the Contractor or of any subcontractor performing any portion of the work included in this Contract.

ART. 35 - SUPERINTENDENCE BY CONTRACTOR

The Contractor shall employ at the site of the work during the performance of any part thereof, a competent foreman or superintendent who shall be satisfactory to the Engineer and who shall have full authority to act for the Contractor, and all directions given such foreman or superintendent shall be as binding as if given to the Contractor.

ART. 36 - COMPETENT MEN TO BE EMPLOYED

The Contractor shall employ only competent, skillful men to do the work, and whenever the Engineer shall notify the Contractor, in writing, that any man on the work is, in his opinion, incompetent, unfaithful, disorderly, or otherwise unsatisfactory, the Contractor shall take such measures as are deemed necessary by the Engineer.

ART. 37 - CONCURRENT CONTRACTS AND OTHER CONTRACTORS

The right is reserved by the Owner to do work using other contractors and to permit public utility companies and others to do work during the progress and within the limits of or adjacent to the Project, and the Contractor shall conduct his work and cooperate with such other parties so as to cause as little interference as possible with such other work, as the Engineer may direct.

It is agreed that the Contractor shall not be entitled to any damages or extra compensation from the Owner on account of any work performed by other contractors, that in any way affects the work under this Contract. The Engineer shall decide all questions between the Contractor hereunder, and the other contractors, and the order of carrying on the work shall always be subject to his direction and approval.

When the territory of one contract is the necessary or convenient means of access for the transportation of men, materials, equipment or appliances for the execution of work by others, the privilege of access thereon or trespass thereon or any other reasonable privilege may be granted by the Engineer. Employees of the Contractor shall not enter upon adjoining property to underpin or protect adjoining structures or for any other purpose whatsoever except with the written permission of the owners or lessees as provided by law.

If, in the judgment of the Engineer, the joint occupation of the site of the work by the Owner or by two or more contractors working on different contracts at the same time, actually impedes progress in the work herein described, then upon the recommendation of the Engineer, the Owner may extend the time for the completion of the work in the amount which accords with and compensates for the delays so caused.

In case the Contractor, by his own acts or the acts of any person or persons in his employ, shall unnecessarily delay, in the opinion of the Engineer, the work of the Owner or other contractors, by not properly cooperating with them or by not affording them sufficient opportunity or facility to perform work as may be specified, the Contractor shall, in that case, pay all cost and expenses incurred by such parties due to any such delays and he hereby authorizes the Owner to deduct the amount of such cost and

expenses from any moneys due or to become due the Contractor under this Contract. The Engineer, subject to the approval of the Owner, shall decide the extent of such delay or delays, and the amount of such costs and expenses, and his decisions shall be binding upon all parties concerned. Nothing contained in this paragraph shall, however, relieve said Contractor from any liability or damage resulting to the Owner on account of such delay or delays.

Where the work of the Contractor adjoins other adjacent concurrent contracts, the Contractor doing the latest work is responsible for making all final connections to the work of other adjacent concurrent contracts, as directed by the Engineer.

ART. 38 - MUTUAL RESPONSIBILITY OF CONTRACTORS

Should the Contractor cause damage to any other contractor on the work, Contractor agrees, upon due notice, to settle with such Contractor by agreement or arbitration, if he will so settle. If such other contractor sues the Owner on account of any damage alleged to have been so sustained, the Owner shall notify the Contractor, who shall defend such proceedings and, if any judgment against the Owner arises there from, the Contractor shall pay or satisfy it and pay all costs incurred by the Owner.

ART. 39 - SUBCONTRACTS

The Contractor shall, within thirty days after signing of the Contract, notify the Engineer in writing of the names of subcontractors he proposes for principal parts of the work.

The Contractor shall not enter into contract with any subcontractor until he receives the Owner's or Engineer's approval as to the firm's competence, experience, financial capability and municipal tax clearance. Subcontractors will be required to carry insurance equal to that of the prime contractor, or must be a named insured on all of the Contractor's policies.

The Engineer shall, on request, furnish to any subcontractor, wherever practicable, evidence of the amounts certified for payment on his account.

Each payment requisition submitted by a subcontractor to Contractor shall include a statement showing the status of all pending construction change orders, other pending change directives and approved changes to the original subcontract. Such statement shall identify the pending construction change orders and other pending change directives, and shall include the date such change orders and directives were initiated, the costs associated with their performance and a description of any work completed. As used herein, "pending construction change order" or "other pending change directive" means an authorized directive for extra work that has been issued to a subcontractor.

The Contractor agrees that he is as fully responsible to the Owner for the acts and omissions of his subcontractors and of persons either directly or indirectly employed by them as he is for acts and omissions of persons directly employed by him. He further agrees that he will bind his subcontractors to each and every part of the Contract Documents.

The Contractor shall comply with Connecticut General Statutes: Sec. 49-41a as to payment to subcontractors and material men, which provides as follows:

"The general contractor, within thirty (30) days after payment to the Contractor, shall pay any amounts due any subcontractor, whether for labor performed or materials furnished, when the labor or materials have been included in a requisition submitted by the Contractor and paid by the Owner.

The general contractor shall include in each of its subcontracts a provision requiring each subcontractor to pay any amounts due any of its subcontractors, whether for labor performed or materials furnished, within thirty (30) days after such subcontractor received a payment from the general contractor which encompasses labor or materials furnished by such subcontractor.”

Nothing contained in the Contract Documents shall create any contractual relation between any subcontractor and the Owner.

ART. 40 - RELATIONSHIP OF CONTRACTOR AND SUBCONTRACTORS

The Contractor agrees to bind every subcontractor and every subcontractor agrees to be bound by the terms of the Contract, the General Conditions, the drawings and specifications, and other Contract Documents as far as applicable to his work, including the following provisions of this article, unless specifically noted to the contrary in a subcontract approved in writing as adequate by the Engineer.

The Contractor and the subcontractor agree that:

- (1) Nothing in this article shall create any obligation on the part of the Owner to pay to or to see to the payment of any sums to any subcontractor.
- (2) All Contractors and subcontractors shall cooperate with each other and must conform to the directions of the Engineer, in order that all parts of the work may progress harmoniously and expeditiously.
- (3) Each subcontractor must aid the others in as far as his services may be reasonably required. All Contractors will be required to make themselves familiar with the requirements of the drawings and specifications for the entire work.
- (4) The Contractor on one branch of the work shall allow the subcontractor for other branches of the work free access to the project and grounds in order that they may execute their work properly and promptly.

All subcontractors shall read the entire General Conditions and specifications and shall be held responsible for all items called for in them whether specifically mentioned under their particular headings or not.

IT IS UNDERSTOOD THAT THE ENGINEER WILL SUPPLY ALL INFORMATION TO CONTRACTORS ONLY AND NOT TO SUBCONTRACTORS. THE CONTRACTOR SHALL NOT ACCEPT THE STATEMENT OF ANY SUBCONTRACTOR THAT THE ENGINEER HAS APPROVED ANY SUBCONTRACTORS, HIS WORK OR ANY OF HIS DRAWINGS, AS THE ENGINEER WILL MAKE ALL SUCH APPROVALS TO THE CONTRACTOR IN WRITING.

ART. 41 - ASSIGNMENTS

The Contractor or his thoroughly qualified and designated representatives shall give his personal attention constantly to the faithful prosecution of the work.

He shall not sell, transfer, assign or otherwise dispose of this Contract or any part thereof to any third party. The Contractor shall perform with his own organization and with the assistance of workmen under his immediate superintendence work amounting to not less than forty percent (40%) of the total price bid for the Project. Subject to the above provision and to the consent of the Owner, work may be sublet. It is understood, however, that any consent of the Owner for the subletting of any of the work under the Contract in no way relieves the Contractor of his full obligations under the Contract. The consent to sublet any part of the work and the acceptance by the Owner of the surety bond shall not be construed

to be an approval of the said subcontract or of any of its terms, but shall operate only as an approval of the making of a subcontract between the Contractor and subcontractor. The subcontractor shall look only to the Contractor for the payment of any claims of any nature whatsoever arising out of the said Contract, and said subcontractor agrees, as a condition of the granting by the Owner of the consent to the making of said subcontract, that neither the subcontractor, his agents or employees shall make any claim whatsoever against the Owner for any work performed or thing done by reason of said subcontract. The Owner will not consent to the making of any subcontract unless the proposed subcontractor furnishes a statement to the effect that said subcontractor is acquainted with all the provisions of the Contract Documents and agrees thereto.

The Contractor shall not assign, by power of attorney or otherwise, any of the moneys to become due and payable under this Contract, unless by and with the written consent of the Owner, and such consent of approval, if given, will in no way relieve the Contractor from any of the obligations of said Contract.

Assignment of this Contract or any part thereof or of any funds to be received thereunder by the Contractor shall contain a clause to the effect that it is agreed that the funds to be paid the assignee under the assignment are subject to a prior lien for services rendered or materials supplied for the performance of the work called for in said Contract in favor of all persons, firms, or corporations rendering such services or supplying such materials.

If the Contractor shall, without previous written consent, assign, transfer, convey, sublet, or otherwise dispose of the Contract in whole or in part of his right, title or interest therein, or any of the monies to become due under the Contract from any person, firm, or corporation, the Contract may at the option of the Owner, be revoked and annulled and the Owner thereupon is relieved and discharged from any and all liability and obligations growing out of same to the Contractor and to his assignee or transferee; and no right under this Contract or to any money to become due hereunder, shall be asserted against the Owner in law or in equity by reason of any so-called assignment of this Contract or any part thereof, or any monies to grow due hereunder unless authorized as aforesaid by the written consent of the Owner.

ART. 42 - SAVE OWNER HARMLESS

The Contractor shall, from time to time, as required by the Owner, furnish satisfactory evidence that all persons who have done work or furnished materials under this Contract, or have suffered damage on account of the Contractor's operations, have been fully paid or secured.

The Contractor shall indemnify and save harmless the Owner, its Engineer, officers, agents and servants and each and everyone of them against and from all suits, and costs of every kind and description, including court costs and attorney's fees, and from all damages to which the Owner or any of its officers agents or servants may be subjected by reason of injury to the person or property of others resulting from the performance of the Project, or through the negligence of the Contractor, or through any improper or defective machinery, implements or appliances used by the Contractor in the project, or through any act of omission on the part of the Contractor or his agents, employees or servants, whether or not caused by or contributed to by the Owner, Engineer, their agents, employees, or others; and he shall further indemnify and save harmless the Owner; its officers, agents, and servants from all suits and actions of any kind or character whatsoever which may be brought or instituted by any subcontractor, material-man or laborer who has performed work or finished materials in or about the Project or by, or on account of, any claims or amount recovered from infringement of patent, trade-mark or copyright. The cost thereof shall be included in the prices bid for the various parts of the work. So much money due to the Contractor under and by virtue of the Contract as shall be considered necessary by the Owner may be retained by the Owner and held until such bids, actions, claims or amounts shall have been settled and suitable evidence to that effect furnished to the Owner. It is understood and agreed, however, that the Owner hereby assumes no

obligations toward such claimants, nor in any way undertakes to pay such claims out of any funds due or that may become due the Contractor, or out of its own funds.

ART. 43 - LIABILITY OF CONTRACTOR IS ABSOLUTE

The liability of the Contractor hereunder for all injuries to persons or damages to property is absolute and is not dependent upon any question of negligence on his part or on the part of his agents, servants, or employees, and neither the approval of the Engineer of the methods of doing work nor the failure of the Engineer to call attention to improper or inadequate methods or to require a change in methods, nor the neglect of the Engineer to direct the Contractor to take any particular precautions or to refrain from doing any particular thing shall excuse the Contractor in case of any injury to persons or damages to property.

ART 44 - PERMITS

The Contractor shall obtain the following permits, approvals and certifications: CT Department of Transportation Road Work.

Although the permits or approvals cited above have been acquired by the Owner, the Contractor shall comply with the conditions and provisions of each that relate to the construction. Where special bonds, escrows and/or other forms of payments and guarantees are required, the Contractor shall provide these items at no additional cost to the Owner.

The Contractor shall obtain and pay for all other permits required for the prosecution of the work under the Contract. He shall pay all charges and expenses and shall furnish all bonds and insurance stipulated in the permits, and shall indemnify and save harmless the Owner from all claims for damages and any actions that may arise thereunder. Before the final acceptance of the work, and as a prerequisite to the release of the semi-final payment, the Contractor shall secure a written release from the authorities having jurisdiction over the lands occupied by him certifying to the satisfactory restoration of all pavements and other surfaces and the utility structures removed or safeguarded for the work.

ART. 45 - LAWS AND ORDINANCES

The Contractor will be required to comply with all federal, state, and municipal laws, ordinances and regulations in any manner affecting those persons engaged or employed in the work, or the materials used in the work, or in any way affecting the conduct of the work, either with respect to hours or labor or otherwise, and of all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same. If any discrepancy or inconsistency is discovered in the drawings, specifications, or Contract for this work in relation to any such law, ordinance, regulation, order, or decree, he shall forthwith report the same to the Engineer in writing. He shall at all times himself observe and comply with, all such laws, ordinances, regulations, orders and decrees, and shall protect and indemnify the Owner and his agents against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by himself or his employees.

The Contractor shall comply in particular to the following:

- Rules and Regulations of the Town of Brookfield, W.P.C.A.

The Contractor hereby agrees to comply with all said legal requirements and agrees that upon his failure to comply with the provisions thereof, this contract may be voidable at the option of the Owner.

ART. 46 - STATE LABOR STANDARDS/ WAGE RATES

The Contractor shall comply with all requirements of the labor laws of this State applicable to contracts for construction, alteration or repair of any public work.

Where the project is for new public works construction greater than \$1,000,000 or repair or rehabilitation work greater than \$100,000, the Contractor must abide by State Wage Rates as published by the Department of Labor in accordance with Connecticut General Statute Sec. 31-53(g).

In the event that any of the provisions contained herein or any other labor standards subsequently made applicable by passage of State Law during the life of this Contract differ from standards in effect now or modified during the life of this Contract, then the more rigorous standards shall take precedence and prevail.

The wages paid on an hourly basis to any mechanic, laborer or workman employed upon the Work herein contracted to be done and the amount of payment or contribution paid or payable on behalf of each such employee to any employee welfare fund, as defined in Section 31-53 (h) of the Connecticut General Statutes, shall be at a rate equal to the rate customary or prevailing for the same work in the same trade or occupation in the town where the work is being performed. Any Contractor who is not obligated by agreement to make payment or contribution on behalf of such employees to any such employee welfare fund shall pay to each employee as part of his wages, the amount of payment or contribution for his classification on each pay day.

The Contractor and all his subcontractors shall keep accurate records showing the name, craft or trade, and actual hourly rate of work under the Contract and shall preserve said records for two years from date of payment. The records shall be open at all reasonable hours to the inspection of the Owner and the Commissioner of Labor or their duly authorized representatives. One copy of weekly payroll records shall be filed with the Owner as required by law.

In the event it is found that any workman employed by the Contractor or his subcontractors has been paid less than the prevailing wage listed therein for the class of work performed, the Owner may terminate the Contractor's or Subcontractors right to proceed within the work, or such part of the work as to which there has been a failure to pay required wages and to prosecute the work to completion or otherwise. The Contractor and his surety shall be liable to the Owner for any excess costs occasioned thereby.

Before final payment is made by the Owner of any sum or sums due on account of work performed under the Contract, the Contractor and his subcontractors shall file written statements with the Owner certifying to the amounts then due and owing to any and all workmen for wages earned. The statements shall set forth the names of the persons whose wages are unpaid and the amount due each. The statements shall be verified by the oaths of the Contractor or subcontractor, as the case may be.

The Contract will not be awarded to any contractor who has failed to pay prevailing wages, and no subcontractor will be approved who has failed to pay prevailing wages.

ART. 47 -NONDISCRIMINATION AND AFFIRMATIVE ACTION PROVISIONS FOR MUNICIPAL PUBLIC WORKS/QUASI-PUBLIC AGENCY PROJECT CONTRACTS

(A)(1) The contractor agrees and warrants that in the performance of the contract such contractor will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, status as a veteran, intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by such contractor that such disability prevents performance of the work involved, in any manner prohibited by the laws of the United States or of the state of Connecticut; and the contractor further agrees to take affirmative action to ensure that applicants with job-related qualifications are employed and that employees are treated when employed without regard to their race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, status as a veteran,

intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by such contractor that such disability prevents performance of the work involved; (2) The contractor agrees, in all solicitations or advertisements for employees placed by or on behalf of the contractor, to state that it is an “affirmative action-equal opportunity employer” in accordance with regulations adopted by the Commission on Human Rights and Opportunities; (3) The contractor agrees to provide each labor union or representative of workers with which such contractor has a collective bargaining agreement or other contract or understanding and each vendor with which such contractor has a contract or understanding, a notice to be provided by the Commission on Human Rights and Opportunities advising the labor union or workers' representative of the contractor's commitments under this section, and to post copies of the notice in conspicuous places available to employees and applicants for employment; (4) The contractor agrees to comply with each provision of this section and sections 46a-68e and 46a-68f and with each regulation or relevant order issued by said commission pursuant to sections 46a-56, 46a-68e, 46a-68f and 46a-86; and (5) The contractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the contractor as relate to the provisions of this section and section 46a-56.

(B) If the contract is a public works contract, municipal public works contract or contract for a quasi-public agency project, the contractor agrees and warrants that he or she will make good faith efforts to employ minority business enterprises as subcontractors and suppliers of materials on such public works or quasi-public agency project.

(C) For the purposes of this section, “contract” includes any extension or modification of the contract, “contractor” includes any successors or assigns of the contractor, “marital status” means being single, married as recognized by the state of Connecticut, widowed, separated or divorced, and “mental disability” means one or more mental disorders, as defined in the most recent edition of the American Psychiatric Association's “Diagnostic and Statistical Manual of Mental Disorders”, or a record of or regarding a person as having one or more such disorders. For the purposes of this section, “contract” does not include a contract where each contractor is (1) a political subdivision of the state, including, but not limited to, a municipality, unless the contract is a municipal public works contract or quasi-public agency project contract, (2) any other state, as defined in section 1-267, (3) the federal government, (4) a foreign government, or (5) an agency of a subdivision, state or government described in subdivision (1), (2), (3) or (4) of this subsection.

(D) For the purposes of this section, “minority business enterprise” means any small contractor or supplier of materials fifty-one per cent or more of the capital stock, if any, or assets of which is owned by a person or persons: (1) Who are active in the daily affairs of the enterprise, (2) who have the power to direct the management and policies of the enterprise, and (3) who are members of a minority, as such term is defined in subsection (a) of section 32-9n of the Connecticut General Statutes; and “good faith” means that degree of diligence which a reasonable person would exercise in the performance of legal duties and obligations. “Good faith efforts” shall include, but not be limited to, those reasonable initial efforts necessary to comply with statutory or regulatory requirements and additional or substituted efforts when it is determined that such initial efforts will not be sufficient to comply with such requirements.

(E) The contractor shall develop and maintain adequate documentation, in a manner prescribed by the Commission on Human Rights and Opportunities, of its good faith efforts.

(F) The contractor shall include the provisions of subsections (a) and (b) of this section in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the state, and in every subcontract entered into in order to fulfill any obligation of a municipal public works contract or contract for a quasi-public agency project, and such provisions shall be binding on a subcontractor, vendor or manufacturer, unless exempted by regulations or orders of the Commission on Human Rights and

Opportunities. The contractor shall take such action with respect to any such subcontract or purchase order as the commission may direct as a means of enforcing such provisions, including sanctions for noncompliance in accordance with section 46a-56; provided, if such contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the commission regarding a state contract, the contractor may request the state of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the state and the state may so enter.

ART. 48 - SOCIAL SECURITY ACT

The Contractor shall be and remain an independent contractor with respect to all services performed hereunder and agrees to and does hereby accept full and exclusive liability for the payment of any and all contributions or taxes for social security, unemployment insurance, or old age retirement benefits, pensions or annuities now or hereafter imposed under any state or federal law which are measured by the wages, salaries, or other remuneration paid to persons employed by the Contractor on work performed under the terms of this Contract, and further agrees to obey all lawful rules and regulations and to meet all lawful requirements which are now or hereafter may be issued or promulgated under said respective laws by any duly authorized state or federal officials; and said Contractor also agrees to indemnify and save harmless the Owner from any such contributions or taxes or liability therefor.

ART. 49 - SAFETY PROVISIONS

It is understood that the Contractor will be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. He will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to all employees on the work and other persons who may be affected thereby.

The Contractor will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property, or to protect them from damage, injury or loss. He will erect and maintain, as required by the conditions and the progress of the work, all necessary safeguards for safety and protection and in addition he will comply with all applicable recommendations of the Manual of Accident Prevention in Construction of the Associated General Contractors of America, Inc.

If at any time, in the opinion of the Engineer, the work is not properly safe in respect to public travel, persons on or about the work, or public or private property, the Engineer shall have the right to order such safeguards to be erected and such precautions to be taken as he deems advisable and the Contractor shall comply with such orders. If, under such circumstances, the Contractor does not or cannot immediately put the same into proper and approved condition or if the Contractor or his representative is not upon the site so that he can be immediately notified of the insufficiency of safety precautions, then the Engineer may cause the work to be put into such a condition that it shall be, in his opinion, in all respects safe, and the Contractor shall pay all expenses of such labor and materials as may have been used for this purpose by him or by the Engineer. Such actions of the Engineer, or his failure to take such action, shall in no way relieve the Contractor of the entire responsibility for any cost, loss or damage by any party sustained on account of the insufficiency of the safety precautions taken by him or by the Engineer acting under authority of this section.

The Contractor shall comply with the Department of Labor Safety and Health regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54), or subsequent amendments to such regulations.

This project is subject to all of the Safety and Health Regulations (See 29 CFR 1518) as promulgated by the U.S. Department of Labor on April 17, 1971. Contractors are urged to make themselves familiar with the requirements of these regulations.

The Contractor shall comply with the Owner's Confined Space Entry Program, and no personnel will be permitted to participate in any work or interact with the Contractor if the Contractor does not have the appropriate equipment in compliance with said program.

The Contractor is responsible for establishing and maintaining a health and safety program throughout the course of the project so as to meet all Local, State, Federal and OSHA requirements.

The Contractor shall keep in his office, ready for immediate use, all articles necessary for giving first aid to the injured. He shall also have standing arrangements for the immediate removal and hospital treatment of any employees or persons who may be injured on or about the work.

ART. 50- LAND FOR CONTRACTOR'S USE

Land and easements for the purpose of this Contract will be provided by the Owner. If the Contractor desires the temporary use, during construction, of land or lands to which the Owner has no rights, he shall secure written permission from the owners and shall file a duplicate copy of such permission with the Engineer and Owner. Land shall not be used or occupied by the Contractor prior to the securing of permission. The Contractor shall at all times save harmless the Owner, from actions by third parties by reason of any acts or omissions by the Contractor.

Delays in easement acquisition shall act only to extend the contract period, as reviewed in other sections of the contract documents. No guarantees are given herein that all needed lands will be available at the time of contract award. Should it be required as a part of this Contract to perform work within the limits of private property, or in rights-of-way, such work shall be done in conformity with all permits and agreements between the Owner and the owners of such property, and whether or not such a condition be part of the agreement, care shall be taken to avoid injury to the premises entered, which premises shall be left in a neat and orderly condition by the removal of rubbish and the grading of surplus materials and the restoration of said private property to the same general conditions as at the time of entry for work to be performed under this Contract.

ART. 51- USE OF PREMISES

The Contractor shall confine his materials and their storage and the operation of his workmen to limits indicated by law, ordinances, permits, or directions of the Engineer, and shall not unreasonably encumber the premises with such materials, but shall store them in orderly fashion, so that they will not interfere with the work under this or other contracts. The Contractor shall not load or permit any part of the work to be loaded with a weight that will endanger its safety or unduly affect the structure or any part thereof. The Contractor shall enforce the instructions of the Engineer regarding signs advertisements, fires, and smoking.

ART. 52- PROTECTION OF PREMISES

The Contractor shall properly protect the Owner's and adjoining property from injury or damage. Any damage to same must be made good without delay. The Contractor shall make good, at his own expense, any such injury or damage done and shall leave all in as good condition as found when operations were started.

ART. 53- SANITARY FACILITIES

The Contractor shall provide and maintain in a strictly sanitary manner toilet facilities for his workmen, which shall be screened from public view. The location and the method of waste disposal shall be approved. The Contractor shall observe and enforce all sanitary regulations and maintain satisfactory sanitary conditions around and on all parts of the work.

ART. 54- TEMPORARY WATER

The Contractor shall provide and maintain temporary potable water service connections and fixtures as specified for his own use and the use of other contractors doing work at the site. The cost of temporary water meters, if required, and service charges for all water will be paid by the Contractor.

When work is completed, the Contractor shall remove all temporary water connections and fixtures as required.

The Contractor shall furnish at his own expense all water required during the performance of work under the Contract, including testing, paying for the expense and charges of same, and installing and paying for a meter if it is required.

ART. 55- TEMPORARY LIGHT, POWER, AND TELEPHONE

The Contractor shall be responsible for the furnishing of temporary light and power.

The Contractor, at his own expense, shall arrange with the local telephone company for all telephone service required by him in the performance of the work.

ART. 56- TEMPORARY HEATING

Each Contractor, at his own expense, shall provide, install, and maintain approved heating devices as required for supplying temporary heat of sufficient volume to protect the work under his Contract and to assure suitable working conditions for his workmen. Such devices shall be installed and operated in such manner that no hazards will result and that no damage will be done to any part of his work or the work of other Contractors.

ART. 57- CARE AND PROTECTION OF WORK AND MATERIALS

From the commencement of the work until its completion, the Contractor shall be solely responsible for damages caused to the property of the Owner, for the care and protection of the work covered by the Contract, and for the materials and equipment delivered at the site or incorporated in the work.

All excavated materials, construction equipment, and materials and equipment to be incorporated in the work, shall be so placed as not to injure the work and so that free access may be had at any time to all parts of the work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly and conveniently stored so as to inconvenience as little as possible public travel and adjoining tenants.

All loss, injury, or damage to the work or materials, from whatever cause, shall be made good at the expense of the Contractor.

The Contractor shall provide suitable and adequate storage room for materials and equipment during the progress of the work, including approved weathertight storage for all materials and equipment which might deteriorate if left uncovered. He shall provide protection against damage or deterioration for all equipment during storage, and after installation, until the equipment is put to use by the Owner.

During adverse weather, the Contractor shall take all necessary precautions so that the work may be properly done and be satisfactory in all respects. When required, protection shall be provided by use of tarpaulins, wood building shelters, or other approved means.

During cold weather, materials shall be preheated, if required, and the materials and adjacent structure into which they are to be incorporated shall be made and kept sufficiently warm so that a proper bond will take place and proper curing, aging and drying will result. Protected spaces shall be artificially heated by approved means which will result in a moist or a dry atmosphere according to the particular requirements of the work being protected.

The Engineer may suspend construction operations at any time, when in his judgment, the conditions are unsuitable or the proper precautions are not being taken.

The Contractor shall at all times have, as directed or approved, a sufficient number of watchmen to protect the property of the Owner, to exclude unauthorized persons from the work and to protect traffic on the public highways.

ART. 58- OWNERSHIP OF MATERIALS

Nothing in the Contract shall be considered as vesting in the Contractor any right of property in materials used, after they shall have been attached or affixed to the work or the soil, nor in materials which have been accepted for partial payment at the site of the work, as provided hereinafter, but all such materials shall upon being so attached or affixed, or so accepted, become the property of the Owner.

ART. 59- CHATTEL MORTGAGES

No materials or supplies for the work shall be purchased by the Contractor or by any subcontractor subject to any chattel mortgage or under a conditional sale or other agreement by which an interest is retained by the seller. The Contractor warrants that he has clear title to all materials and supplies used by him in the work.

ART. 60- LINES AND GRADES

All work shall be constructed according to the lines and grades shown and approved. At the site, the Engineer will lay out and mark upon the ground a base line and bench mark, from which the Contractor shall be responsible for staking out the construction lines. For sewers, the Engineer will lay out and mark suitable number of control points and bench marks. The Contractor shall employ the services of a land surveyor, licensed to practice in this state, for laying out the work, including setting of key or principal stakes, markers and levels, and preparation of cut sheets, if required, on a form approved by the Engineer.

The Contractor shall furnish all stakes, markers, and other materials, and shall furnish any assistance that the Engineer may require in laying out the base lines and establishing the bench marks, and in checking and measuring the work. Whenever the Engineer finds it necessary to carry on his operations on Sundays, legal holidays, or other times when the work of the Contractor is not in progress, the Contractor shall furnish all necessary service and assistance. He shall not proceed until he has received from the Engineer such points and instructions as may be necessary for the progress of the work. Any work improperly done without lines or levels or instructions shall be removed and replaced by the Contractor at his own expense.

No direct payment will be made for the cost to the Contractor of any of the work or delay occasioned by giving lines and grades, or making other necessary measurements, or by inspection, compensation therefor being considered as having been included in the bid or stipulated prices.

ART. 61- PRE-CONSTRUCTION AND CONSTRUCTION PHOTOGRAPHS

The Contractor shall furnish a series of photographs, taken by a commercial photographer, to show the site of the work before construction. Photographs shall be taken at such locations as may be determined by the Engineer, or at a spacing of approximately 50 feet apart in streets and 100 feet in easements and wetland areas. Two glossy prints of each picture shall be submitted to the Engineer before construction.

The Contractor shall also furnish a series of construction photographs, to show the progress of the work. At least 6 photographs shall be taken monthly at such locations as may be determined by the Engineer. Two glossy prints of each picture taken during the month shall be submitted to the Engineer at the time of the monthly estimate for progress payment. Email of photos will also be accepted.

Prints for submission shall not be less than 8 in. by 10 in. in size, and inserted in a clear plastic sleeve for binding, properly identified by text and dates on the reverse side. Negatives of all photographs, including identifications shall be furnished to the Engineer.

ART. 62- RECORD DRAWINGS

Concurrent with progress of installation, the Contractor shall maintain a set of as-built record drawings, consisting of a reproducible marked set of Engineer's drawings with additional sketches as required, denoting and dimensioning accurately all changes in elevation, location and size, of all items deviating from Engineer's drawings. The set shall be kept in the Contractor's field office and be made available for inspection by the Engineer upon request.

Upon completion of work, the Contractor shall deliver to the Engineer one up-to-date set of these as-built record drawings, prepared by a Connecticut State licensed land surveyor.

ART. 63- TIME OF THE ESSENCE

Inasmuch as the provisions of this Contract relating to the time for performance and completion of the work are for the purpose of enabling the Owner to proceed with the construction of a public improvement in accordance with a predetermined program, and inasmuch as failure to complete the work within the period specified may result in a loss to the Owner, such provisions are of the essence of this Contract.

ART. 64- NIGHT, SUNDAY AND HOLIDAY WORK

Unless otherwise especially permitted by the Engineer, no work shall be done between the hours of 4:30PM and 9:00AM, nor on Sunday or Legal Holidays, except as necessary for the proper care and protection of the work already performed. The Engineer and Owner shall be informed a reasonable time in advance of the beginning of performance of such work. Only such work will be permitted at night as can be done satisfactorily and in a first class manner and without disturbance to adjoining property owners. Good lighting and all other facilities for carrying out and inspecting the work shall be provided and maintained at all points where such work is being done. Work performed after regular working hours, on Sundays, or Legal Holidays, shall cause no additional expense to the Owner.

ART. 65- WORK IN FREEZING WEATHER

Unless written permission is given, work liable to be affected by frost shall be suspended during freezing weather. When work proceeds in such weather, the Contractor shall provide sufficient and approved facilities for creating workable conditions and protecting the work after its completion, as approved by the Engineer.

ART. 66- UNNECESSARY NOISE

The Contractor shall use every effort and means possible to minimize or eliminate noise caused by his operations, which the Engineer may consider objectionable. The Contractor shall provide working machinery, equipped with silencers or mufflers where required, designed to operate with the least possible noise.

ART. 67- WORK IN STREETS AND HIGHWAYS

The Contractor shall obtain from the proper authorities, permission to open any State, County or Municipal highway. The Contractor shall file with the Engineer, and with the agencies having jurisdiction, triplicate copies of sketches and descriptions showing the exact location and size of the opening or excavation, the time during which it is proposed to make such opening or excavation, and the proposed method of maintaining traffic during construction. The Contractor shall not make any such opening or excavation until written permission has been granted by the agencies having jurisdiction and the Engineer.

If such agencies require inspection, traffic control, signaling or other work to be done by its own forces, the Contractor shall arrange for and pay for the same.

The Contractor shall not close or obstruct any portion of a street, road, or private way without obtaining permits therefor from the proper agencies. If any street or private way shall be rendered unsafe by the Contractor's operations, he shall make such repairs or provide such temporary ways or guards as shall be acceptable to the Engineer.

After the completion of backfilling in public highways, the Contractor shall remove all surplus material, regrade, and leave in good order and dust-free condition all roadways disturbed by his operations.

He shall maintain the surface of the street over the trenches in good condition, promptly filling in all depressions caused by settlement of the backfill.

ART. 68- MAINTAINING AND SAFEGUARDING TRAFFIC

The Contractor as directed, shall build and maintain such temporary roads, passageways, trestles, and bridges as shall be deemed necessary for the accommodation of traffic on streets and roadways interfered with by the Contractor's operations, for convenient access to the various parts of the work, for access to adjacent buildings and properties, and for other necessary purposes incidental to the work. He shall erect such temporary guards, fences, warning signs, lights, and signals as may be necessary or required to protect all traffic on the streets and roadways. He shall not obstruct vehicular traffic unless he has permission from the agencies having jurisdiction to bar temporarily all traffic from the site of the work. He shall not deprive any building or property of safe and proper access except with the consent of the occupant and after due notice to the Engineer. Free access must be given to every fire alarm box, fire hydrant, valve box, or valve chamber. The temporary roads and the Contractor's access roads shall be located where directed or approved and shall be maintained in good condition. Calcium chloride or other approved means, shall be used to maintain the roads in a dust-free condition. The Contractor shall indemnify and save harmless the Owner from any expense whatsoever due to his operations in streets and highways.

ART. 69 - HAULING MATERIALS

Before starting any work, the Contractor shall arrange with the municipal, County, or State officials having jurisdiction for the use of routes of travel for hauling materials that will result in minimum inconvenience to the traveling public. Routes of travel so scheduled shall be adhered to throughout the course of the work.

The Contractor shall, at his own expense, handle, haul and distribute all materials and all surplus materials on the different portions of the work as required. Delays in handling involving storage charges and demurrage charges by the railroad and other companies shall be at the expense of the Contractor.

ART. 70- OBSTRUCTIONS ENCOUNTERED

In addition to showing structures to be built under this Contract, the drawings show certain information regarding the pipe lines and other structures which exist at the site of the work, both at and below the surface of the ground. The Owner expressly disclaims any responsibility for the accuracy or completeness of the information given on the drawings with regard to existing structures and pipe lines, and the Contractor will not be entitled to any extra compensation on account of inaccuracy or incompleteness of such information, said structures and pipe lines being shown only for the convenience of the Contractor, who must verify the information to his own satisfaction. The giving of this information upon the Contract Drawings will not relieve the Contractor of his obligation to support and protect all pipe lines and other structures which may be encountered during the construction of the work, and to make good all damages done to such pipe lines and structures, as provided in these specifications.

ART. 71- EXISTING UTILITIES

The Contractor will be required, at his own expense to do everything necessary to protect, support and sustain all sewers, water or gas pipes, railroad tracks, or telegraph poles, conduits and other fixtures laid across or along the site of the work. The Engineer, as well as the company or corporation owning said pipes, poles, or conduits must be notified of same by the Contractor before any such fixtures are removed or molested. In case any of the said sewer, gas or water pipes, service pipes, electric lights, power, telephone or telegraph poles, conduits or other fixtures are damaged, they shall be repaired by the authorities having control of the same, and the expense of said repairs shall be deducted from the moneys which are due or become due said Contractor under this Contract.

Should it become necessary to change the position, or temporarily remove any electric conduits, water pipes, gas pipes, or other pipes, or wire, in order to permit the Contractor to use a particular method of construction or in order to clear the structure being built, the Contractor shall notify the Engineer of the location and circumstances, and shall cease work if necessary, until satisfactory arrangements have been made by the owners of the said pipes or wires to properly care for the same. No claims for damages will be allowed on account of any delay occasioned thereby. The entire cost of the changes or temporary removal must be included in the unit or lump sum prices stipulated for the various items of work to be done under this Contract.

ART. 72- CONTINUITY OF UTILITY SERVICES

In all cases where temporary pipes must be installed or where sewage, water, or drainage must be pumped or otherwise carried over or around excavations or any other portions of the work, the Contractor shall furnish such pipes, pumps, and all other materials, equipment, and labor as are required to maintain continuity of service in the utilities affected.

ART. 73- PROTECTING EXISTING STRUCTURES

The Contractor shall, at his own expense, shore up and protect any buildings or structures which may be encountered or endangered in the prosecution of the work, and he shall repair and make good any damages caused to any such property by reason of his operations.

ART. 74- PROTECTING EXISTING TREES AND SHRUBBERY

The Contractor shall protect trees, shrubs, and grassed areas on the lands of the Owner, and on adjacent lands, from being cut, trimmed, or injured, unless specifically ordered otherwise, for clearing the site of the work. Any damage to trees, shrubs, or grassed areas shall be made good by the Contractor, at his own expense, to the satisfaction of the owners thereof.

Tree roots shall not be mutilated nor shall they be cut except by permission of the Engineer. When the Contractor is permitted to cut tree roots, he shall cut the ends off smoothly, without splitting or shattering them. The trunks of the trees shall be carefully protected from damage, and if unavoidable damage occurs, the injured portions shall be neatly trimmed and covered with an application of grafting wax. Excavating machinery, cranes, etc., shall be handled with care to prevent damage to shade trees, particularly to overhanging branches, and branches shall not be cut off except by special permission of the Engineer. No special compensation will be made for the protecting of existing trees and shrubbery, but such cost shall be considered as having been included in the lump sum prices or unit prices as stipulated for the work to be done under the Contract.

ART. 75- MONUMENTS AND LANDMARKS

When any bench mark or monument, whether of stone, concrete, pipe, or a mark on the pavement, designating the lines of the streets or highways or of private property, is in the line of any trench or other construction work and may have to be removed, the Contractor shall notify the Engineer in writing at least 24 hours in advance. Under no circumstance shall such monument be removed or disturbed by the

Contractor or by any of his men without a written order from the Engineer. The Contractor shall furnish the necessary labor which may be required in resetting any monument, under the direct supervision of the Engineer. Should any monument be destroyed through accident or neglect, the Contractor shall be required, at his own expense to employ a licensed surveyor acceptable to the Engineer, to re-establish the monument.

ART. 76- SEWAGE, SURFACE AND FLOOD FLOWS

The Contractor shall furnish all the necessary equipment, shall take all necessary precautions, and shall assume the entire cost of handling any sewage, seepage, storm, surface and flood flows which may be encountered at any time during construction of the work. The manner of providing for these flows shall meet with the approval of the Engineer, and the entire cost of said work shall be considered as included in the prices bid for work to be done under this Contract.

ART. 77- SUSPENSION OF WORK

If the Engineer deems it advisable, or upon a determination by the Owner that all or any portion of the Work should be suspended, delayed or interrupted, then the Engineer may order the Contractor in writing to stop work on all or any part of the Contract, and the Contractor shall do no work when so ordered until he has received written notice from the Engineer to resume work. When work is suspended as above provided, payments for the completed parts of suspended work will be made as provided hereinafter and a suitable extension of time for completing the work will be granted. No payment will be made for work done by the Contractor when done in violation of said order by the Engineer.

ART. 78- ABANDONMENT OF WORK

Should the Contractor abandon or in any manner fail to complete the work under this Contract, the Owner is hereby authorized and empowered to pay any laborers or mechanics for work done who may have been employed by said Contractor upon the work herein, and to pay any claims against the Contractor for materials furnished, out of any funds that would otherwise be due or become due said Contractor under this Contract, and in every such case the Owner is hereby authorized and empowered to ascertain through the Engineer, the amount or amounts due or owing to such labor or laborers, or for materials, from said Contractor, in such manner and upon such proof as said Owner may deem sufficient. And the amount or amounts so found by the Engineer to be due and payable to such labor or laborers, or for materials furnished, shall be final and conclusive against the Contractor, and may thereafter be paid by the Owner to said labor or laborers, or to liquidate claims for material furnished; and any payment may be withheld from said Contractor until all such claims for labor or material on the Contract have been satisfied.

ART. 79- DEFAULT OF CONTRACTOR

The Owner may terminate this Contract upon the occurrence of any one of the following events of Contractor default:

- (1) If the Contractor shall fail, within the time required, to begin the work to be done under this Contract, or
- (2) If the work to be done under this Contract shall be abandoned, or
- (3) If the Contractor shall be adjudged bankrupt or make an assignment for the benefit of creditors, or
- (4) If a receiver or liquidator shall be appointed for the Contractor or for any of his property and shall not be dismissed within 20 days after such appointment, or the proceedings in connection therewith shall not be dismissed within 20 days after such appointment, or the proceeding in connection therewith shall not be stayed on appeal within the said 20 days, or,

- (5) If the Contractor shall fail to or refuse to regard laws and ordinances, and such orders as may from time to time be given by the Owner or the Engineer with respect to the work, or
- (6) If the Contractor shall refuse or fail, after notice from the Engineer, to supply enough properly skilled workmen or proper materials, or
- (7) If the Contractor shall violate any of the provisions or covenants of this Contract or shall not perform the same in good faith in accordance with the terms hereof, or
- (8) If the Contractor shall refuse or fail to prosecute the work or any part thereof with such diligence as will insure its completion within the period specified (or any duly authorized extension thereof) or shall fail to complete the work within said period, or
- (9) If the Contractor shall fail to make prompt payment to persons supplying labor, material or equipment for the work, or
- (10) If the Contractor shall assign or sublet the work otherwise than as specified, or
- (11) If the Engineer should be of the opinion and shall certify in writing to the Owner that the work or any part thereof is unnecessarily or unreasonably delayed, or that the Contractor is not complying with his orders, or is not executing the Contract in good faith, or that suitable and sufficient workmen, material, plant, power tools, supplies, or other means of carrying on the work are not provided to carry out all requirements of the Contract.
- (12) If the Contractor disregards laws, ordinances, rules, regulations, or orders of any public jurisdiction.
- (13) If the Contractor disregards the authority of the Engineer.

ART. 80- UNFINISHED WORK COMPLETED BY THE OWNER

Upon a declaration of default of the Contractor and termination as hereinbefore provided, the Owner shall, by written notice, order the Contractor not to begin, or not to resume, or to discontinue all work under this Contract or any part of such work, and thereupon the Contractor shall not begin, or shall not resume, or shall discontinue all work or such part thereof, and the Owner shall thereupon have the power, in the manner prescribed by law, to contract for the completion of the work or such part thereof, or to place such and so many persons as they may deem advisable by contract, or call on Surety to complete the work or otherwise to work at and to complete the work or part thereof, or so much of the work or part thereof, as the Owner may direct or may place under contract, and take possession of and use any or all plant, tools, appliances, equipment, supplies, property, and materials as they may find upon the site of the work, and procure or cause to be procured, by contract or otherwise, all plant, tools, appliances, equipment, supplies, property, and materials for the completion of the same, and charge the whole expense of the completion of the work, or part thereof, to the Contractor or his Surety.

The expense so charged, together with the administrative, legal, engineering, and other costs associated with terminating the Contract and re-contracting the Work, and also liquidated damages for delay in the completion of the work, if any, as provided, shall be deducted and paid by the Owner out of such moneys as may be then due or may at any time thereafter become due under and by virtue of this Contract or any part thereof. In case such expense and liquidated damages, if any, shall exceed the sum which would have been payable under this Contract, if the same had been completed by the Contractor, he shall and will pay the amount of such excess to the Owner; and in case such expense and liquidated damages, if any, shall be less than the sum which would be payable to the Contractor, if the Contractor

had completed the Contract, he shall be entitled to the difference, subject to all the other terms, covenants and conditions of this Contract.

ART. 81- CERTIFICATE OF COST OF WORK COMPLETED BY OWNER

In the event of the Owner's undertaking, by contract or otherwise, to perform the work or any part thereof as hereinbefore described, the certificate of the Engineer, as to the amount of work done, the cost and amount of excess cost, if any, of performing or completing the work called for by this Contract, and as to the amount of liquidated damages hereunder, shall be binding and conclusive upon the Contractor, his Sureties, successors, assigns, lienors and to all claimants of any part of the moneys payable hereunder.

ART. 82- CONTINUATION OF WORK BY CONTRACTOR

When any particular part of this work is being carried on by the Owner, by contract or otherwise, under the provisions of this Contract, the Contractor agrees to continue the remainder of the work in conformity with the terms of this Contract and in such manner as not to hinder or interfere with the persons or workmen employed by the Owner.

ART. 83- THE OWNER'S RIGHT TO DO WORK AND THREE DAY CLAUSE

If the Contractor or his subcontractors should neglect to prosecute the work properly or fail to perform any provisions of the Contract, the Owner, after three (3) days written notice to the Contractor, may without prejudice to any other remedy he may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor; provided, however, that the Engineer shall approve both such action and the amount charged to the Contractor.

ART. 84- CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE

If, through no act or fault of the Contractor, the Work is suspended for a period of more than ninety days by the Owner or under an order of court or other public authority, or the Engineer fails to act on any Application for Payment within thirty days after it is submitted, or the Owner fails for 45 days to pay the Contractor any sum finally determined to be due, then the Contractor may, upon seven days' written notice to the Owner and the Engineer, and provided the Owner does not remedy such suspension or failure within that time, terminate the Contract and recover from the Owner payment as provided herein. In lieu of terminating the Contract and without prejudice to any other right or remedy, if the Engineer has failed to act on an Application for Payment within thirty days after it is submitted, or the Owner has failed for 45 days to pay the Contractor any sum finally determined to be due, the Contractor may upon seven days' written notice to the Owner and the Engineer stop the Work until payment of all such amounts due the Contractor, including interest thereon.

In the event the Contractor properly terminates the Contract pursuant to this article, then in such case, the Contractor shall be paid (without duplication of any items):

1. For 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. For 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;
3. For amounts paid in settlement of terminated contracts with Subcontractors, manufacturers, fabricators, suppliers or distributors and others (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and court and arbitration or other dispute resolution costs incurred in connection with termination of contracts with Subcontractors and manufacturers, fabricators, suppliers or distributors); and

4. For reasonable expenses directly attributable to termination.

The Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss or any consequential damages arising out of such termination.

ART. 85- ESTIMATE OF QUANTITIES

Wherever the estimated quantities of work to be done and materials to be furnished under this Contract are shown in any of the Contract Documents including the Proposal, they are given for use in comparing bids and the right is especially reserved, except as herein otherwise provided, to increase them or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the work contemplated under this Contract, and such increase or diminution shall in no way vitiate this Contract, nor shall any such increase or diminution give cause to the Contractor for claims or liability for damages. Unit prices included in the contract documents shall be used for both increases and reasonable decreases in quantities that might occur.

ART. 86- EXTRA WORK AND CHANGES IN THE WORK

Without invalidating the Contract, the Owner may order deletions or deductions in the contract Work or may order extra work or changes involving alterations or additions to the work, the Contract price being adjusted accordingly. Such ordered deletions or increases in the work shall be executed under the conditions of the Contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change.

No extra work or changes in the work covered by the Contract Documents shall be done or made by the Contractor without the written approval by the Owner or the Engineer, acting officially for the Owner, and unless subject to an established unit price, not until the price for doing or making such change is agreed upon in writing.

Changes or credits for the work so ordered and approved shall be determined by one or more, or a combination of three methods, as approved by the Owner as follows:

- (a) By such applicable unit prices, if any, as are set forth in the Contract; or
- (b) If no such unit prices are set forth, then by unit prices or by a lump sum mutually agreed upon by the Owner and the Contractor; or
- (c) If no such unit prices are set forth and if the parties cannot agree upon prices or a lump sum, then, for work performed the Contractor shall receive as compensation the actual cost to him, which cost shall include:
 1. Labor, including foreman;
 2. Materials entering permanently into the work;
 3. The ownership or rental cost of construction plant and equipment during the time of use on the extra or changed work;
 4. Power and consumable supplies for the operation of power equipment during the above time;
 5. Insurance;
 6. Social Security and old age and unemployment contributions;
 7. Plus a fixed fee to be agreed upon but not to exceed 15 percent of the summation of Items 1 through 6 above, which fee shall be compensation to cover the cost of supervision, overhead, bond, profit, and any other general expenses.

If all or part of the extra work is done by a subcontractor, subcontractor's overhead in the amount of 5 percent may be added to cost of labor and materials, if methods (b) or (c) above are used.

The Contractor shall give the Engineer access to all accounts, bills, payrolls, and vouchers relating to such extra work and he agrees that he shall have no claim for compensation for such work unless a statement in writing of the actual cost of the same, fully itemized as to labor, materials, and other allowable costs is presented to the Engineer before the fifteenth day of the month following that during which each specific order was complied with by him.

It is understood and agreed by the Contractor that the Owner reserves the right to have such extra work done by any persons, person, or corporation other than the Contractor, unless an agreement upon the prices to be paid for such extra work can be promptly reached between the Owner and the Contractor. Should said extra work be done by any person, persons, or corporation other than the Contractor, all of the provisions as hereinbefore provided shall apply and the Contractor agrees to make no claim for damages or for any privileges or rights, other than that provided in the Contract, by reason of such work by others, except for an extension of time to perform this Contract as may be certified to the Owner by the Engineer, and approved by the Owner.

Should the Contractor consider himself entitled to extra compensation on account of the before mentioned alterations or changes, he shall notify the Owner by making his claim in writing to the Engineer before proceeding with the work in question. Should the Contractor proceed with the said work in compliance with the written order of the Engineer, it is to be construed as his acceptance of the order and the stipulated compensation for the said work.

ART. 87- CLAIMS FOR EXTRA WORK

If the Contractor claims that any instructions issued by drawings or otherwise involve extra cost under this Contract, he shall give the Engineer written notice thereof within 48 hours after the receipt of such instruction, and in any event before proceeding to execute the work; except in emergency endangering life or property, the procedure shall then be as provided for in the preceding section. No such claim shall be valid unless so made.

ART 88 -SUPPLEMENTARY CONTRACT

Where conditions require an unforeseen and major change in, and addition to the work after the Contract has been signed, the Contractor will undertake to enter into a Supplementary Contract at agreed prices, to cover the cost of said changed work, and shall, if requested, waive any right to do such work as extra work.

ART. 89-CONTRACTOR'S CLAIM FOR DAMAGES

If the Contractor shall claim compensation for any damage sustained by reason of the acts of the Owner or its agents, he shall, within seven days after sustaining of such damage, make a written claim and statement to the Engineer of the nature of damage sustained. On or before the fifteenth day of the month sustained, the Contractor shall file with the Engineer an itemized statement of the details and the amount of such damage alleged to have been sustained and unless such statement is made as thus required, his claim for compensation will not be considered by the Owner.

In addition to the foregoing statements, the Contractor shall, upon notice from the Owner, produce for examination by the representatives of the Owner, all his books of accounts, bills, invoices, payrolls, subcontracts, time books, daily reports, bank deposit books, bank statements, check books, and canceled checks, showing all of his acts and transactions in connection with or relating to or arising by reason of this Contract, and submit himself and persons in his employ for examination under oath by any person designated by the Owner to investigate claims made against the Owner. Unless the aforesaid statements shall be made and filed within the time aforesaid and the aforesaid records submitted for examination, and

the Contractor and his employees submit themselves for examination as aforesaid, the Owner shall be released from all claims arising under, relating to or by reason of this Contract, except for the sums certified by the Owner to be due under the provisions of this Contract.

ART. 90- RESOLUTION OF DISPUTES

This Contract shall be interpreted in accordance with the laws of the State of Connecticut.

All unresolved claims, disputes and other matters in question between OWNER and CONTRACTOR arising out of, or relating to the Contract Documents, or the breach thereof, shall be resolved as follows: a) the parties may agree to submit any such claim, dispute or matter in question to mediation before a mediator acceptable to the parties; b) if the parties do not agree to submit such dispute to mediation, or if such mediation fails to result in resolution of such claim, dispute or matter in question, then by a State court of the jurisdiction in which the Project is located.

ART. 91- EXTENSION OF TIME FOR COMPLETING THE WORK

If the Contractor be delayed in completion of the work under the Contract by any act or neglect of the Owner or of any other Contractor employed by the Owner, or by changes in the work, or by any priority or allocation order duly issued by the Federal government, or by any unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God or of public enemy, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes and severe weather, or by delays of subcontractors or suppliers occasioned by and of the causes described above, or by delay authorized by the Engineer for any cause which the Engineer shall deem justifiable, then:

For each day of delay in the completion of the work so caused, the Contractor shall be allowed one day additional to the time limitation specified in the Contract, it being understood and agreed that the allowance of same shall be solely at the discretion and approval of the Engineer.

No such extension of time shall be made for any delay unless the Contractor, within 5 days after the beginning of the delay, shall have informed the Owner or Engineer in writing of the nature of the delay, its cause, and its estimated duration. The Engineer will ascertain the facts regarding the delay and notify the Contractor within a reasonable time of its decision in the matter.

The Contractor shall use all honorable and reasonable means to prevent strikes, to avoid violations of labor agreements or other actions calculated to create dissatisfaction with working conditions. Should strikes occur, he shall make all proper and reasonable efforts to effect early settlement and resumption of the work. Should collusion by the Contractor be proven in the case of strikes or lockouts, then no extension of time for completion of the Contract will be given. Burden of proof in this case shall rest entirely with the Contractor.

No claim for damages or any claim other than for extensions of time as herein provided shall be made or asserted against the Owner by reason of any delays caused by the reasons hereinabove mentioned.

ART. 92- LIQUIDATED DAMAGES

It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the date of beginning and the time for completion as specified in the Contract of the work to be done thereunder are essential conditions of this Contract; and it is further mutually understood and agreed that the work embraced in this Contract shall be commenced on or before a date to be specified in the Owner's written notice to commence the work.

The Contractor agrees that said work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly

understood and agreed, by and between the Contractor and the Owner, that the time for the completion of all work described in the Contract Documents is a reasonable time for the completion of same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

If the said Contractor shall neglect, fail, or refuse to complete the work within the time specified in the Contract, or within such further time as may be properly granted by the Owner in accordance with the provisions of this Contract, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner the amount specified in the contract, not as a penalty but as liquidated damages for such breach of Contract as hereinafter set forth, for each and every calendar day that the Contractor shall exceed the time stipulated in the Proposal for completing the work.

The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the true value of the damages which the Owner and third parties who are eligible to receive sewer service, will sustain by failure of the Contractor to complete the work on time, such as loss of revenue from service charges, additional costs of interest charges, delays caused to other work by failure to perform this Contract, and other damages, some of which are indefinite and not susceptible of easy proof, and said amount is agreed to be the amount of damage which the Owner will sustain and said amount shall be recovered by the Owner by deducting the same out of any monies due or that may become due the Contractor, and if said monies are insufficient to cover said damages, then the Contractor or his Surety shall pay the amount of the difference.

As specified under "Inspection", the costs of engineering and inspection performed during overtime hours, or after the specified date of completion (regardless of the granting of extensions of time), shall be deducted from funds owed to the Contractor, as damages sustained by the Owner caused solely by actions of the Contractor.

It is further agreed that time is of the essence of each and every portion of this Contract and of the specifications, wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract an extension of time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this Contract.

It is also understood and agreed that the Contractor will not be charged with liquidated damages when the Owner determines that the Contractor is without fault and that the Contractor's reasons for requesting a time extension are acceptable to the Owner. If an extension of time is approved, said liquidated damages will be charged the Contractor from the end of such extension to the completion of the work. However, whether or not an extension of time is granted by the Owner, the Contractor shall pay to the Owner all costs of engineering field work and inspection from the completion date, as determined from the number of days specified for completing the work, to the date of actual completion.

ART. 93- PREPARATION OF ESTIMATES FOR MONTHLY PAYMENTS

Preliminary drafts of estimates for partial or monthly payment for work done and materials delivered shall be delivered to the office of the Engineer no later than the fifth day of the month following the period covered by such estimate.

Each preliminary or final draft payment requisition submitted by the Contractor to Owner shall include a statement showing the status of all pending construction change orders, other pending change directives and approved changes to the original contract. Such statement shall identify the pending construction change orders and other pending change directives, and shall include the date such change orders and directives were initiated, the costs associated with their performance and a description of any work completed. As used herein, "pending construction change order" or "other pending change directive" means an authorized directive for extra work that has been issued to the Contractor.

After the preliminary drafts have been approved, final drafts of such estimates shall be prepared by the Contractor, and delivered to the office of the Engineer no later than the tenth day of the month following the period covered by such estimate. Classes of work listed on a partial estimate shall be only those approved, and in the quantities so approved. Equipment, materials and work shall conform to the approved breakdown statement, and shall be considered only the extent, approved by the Engineer, as indicated on daily work report sheets, as of the date on which the work was done.

On each estimate where pipe and conduits in paved streets are included for payment and the proposal does not contain a separate line item for pavement restoration, the Contractor shall deduct \$15.00 per square yard of permanent pavement area until such time as the permanent pavement is placed and approved. In unpaved areas, the deduction shall be \$10.00 per foot of trench until permanent restoration is completed and releases are obtained from the affected property owners. Deductions for incomplete testing shall be in accordance with the article entitled 'Materials Included in Monthly Estimates. All such deductions shall be made from the Value of Work Completed, before calculation of retention's.

No estimate or payment shall be required to be made when, in the judgment of the Engineer, the total value of the work done since the last estimate amount to less than One Thousand Dollars (\$1000.00).

Deviation from the above procedure by the Contractor will result in disapproval of the estimate. The work and materials included on such disapproved estimate shall not be submitted for consideration until the next monthly estimate is submitted.

ART. 94- DAILY WORK REPORTS AND DELIVERY SLIPS

Daily work reports shall be prepared by the Contractor on forms acceptable to the Engineer, and shall be submitted to the Engineer on or before noon of the day following the day's work reported, properly prepared and signed.

The Contractor shall furnish the Engineer with copies of delivery slips covering all material delivered to the site of the work, which is to be included in any monthly estimate. All materials delivered to the site of the work, whether from a supplier's warehouse or from the Contractor's stock, shall be covered by such delivery slips. Delivery slips shall be submitted daily with the daily work report sheets.

Deviation from the above procedure by the Contractor, as to daily work reports and delivery slips, will result in disapproval of items of work. Such disapproved items shall not be included in any monthly estimate until properly reported on daily work reports and/or on approved delivery slips.

ART. 95- MATERIALS INCLUDED IN MONTHLY ESTIMATES

Allowances for payment to the extent listed herein, for equipment and materials specifically listed on the approved breakdown statement of the lump sum bid, may be included in the next monthly estimate after the stages herein have been reached:

- | | | |
|-----|--|--|
| (a) | Upon completion of delivery | 75% of the equipment or material price shown in the breakdown statement. |
| (b) | Upon completion of erection or installation (including subsurface pipe installation) | Not more than 90% of the installed price shown in the breakdown statement, or in the unit price bid. |
| (c) | Upon successful completion of acceptance tests | 100% of the price shown in the breakdown statement, or in the unit prices bid. |

All such equipment and materials included for payment in the monthly estimate shall be and become the property of the Owner and, on demand, the Contractor at his own expense shall promptly execute, acknowledge, and deliver or cause to be executed, acknowledged, and delivered to the Owner for any and all such equipment and materials included in any monthly estimate, proper bills of sale or other instruments in writing in a form and as required by the Owner from the Contractor and from any person, firm, or corporation manufacturing for, or selling or shipping or delivering to the Contractor any such equipment and materials, conveying and assuring to the Owner title to such materials included in such estimate free from all liens and encumbrances; and the Contractor at his own expense shall mark such materials as the property of the Owner and shall take such other steps, if any, as the Owner may require or regard as necessary to vest title in the Owner to such equipment and materials free from all liens and encumbrances. The Contractor shall, however, notwithstanding such transfer of title to the Owner be absolutely responsible to the Owner for any loss or damage to such equipment and materials until the same shall have been completely installed and tested, all work under the Contract completed and accepted, and shall at his own cost replace any equipment and materials lost or damaged.

ART. 96- PAYMENTS

Not later than 45 days after receipt of the monthly estimate, the Owner will make partial payment to the Contractor on the basis of the estimate of the work performed during the preceding calendar month by the Contractor, and duly approved and certified by the Engineer, which estimate includes the allowances set forth hereinbefore. All such payments shall be considered tentative only, subject to correction in the final estimate, and need not be based on accurate measurement. These payments are to be made purely to aid the Contractor to meet his current bills and for no other purpose.

The Owner will retain the following amounts from each estimate, in addition to payments withheld for payment of claims, defective work, etc., as specified elsewhere:

- a) During construction a retention of 5% payments claimed will be held until completion at "semi-final" payment, after which 2.5% will be retained until completion of the maintenance period, provided that the Contractor is making satisfactory progress and there is no specific cause for greater withholding.
- b) Retentions for payment of claims, defective work, potential losses, etc., as specified elsewhere, may also be withheld.

Failure by the Contractor to pay subcontractors and material men within the time provided by Article 39 and Section 49-41a of the Connecticut General Statutes, shall constitute an event of default and grounds for disapproval by the Engineer of the current periodical estimate for partial payment.

ART. 97-OWNERS RIGHT TO WITHHOLD PAYMENTS AND MAKE APPLICATION THEREOF

The Owner may withhold from the Contractor as much as any approved payments due him as may in the opinion of the Owner be necessary:

- a) To assure the payment of just claims of any persons supplying labor or materials for the work then due and unpaid;
- b) To protect the Owner from loss due to defective work not remedied;
- c) To protect the Owner from loss due to injury to persons or damage to the work or property of other contractors, subcontractors, owners of utilities, or others caused by the act or neglect of the Contractor or any of his subcontractors; or.
- d) In the event that there has been a lapse or cancellation of the insurance required under Article 8.

The Contractor shall, at the request of the Owner, furnish satisfactory proof that all obligations of the nature hereinabove described have been paid, remedied, discharged, or waived. If the Contractor fails to do so, then the Owner may, after having served written notice, withhold from Contractor's unpaid compensation a sum of money deemed reasonably sufficient to cover any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged, whereupon payment to the Contractor shall be resumed in accordance with the terms of this Contract, but in no event shall the provisions of this article be construed to impose any obligations upon the Owner to either the Contractor or his Surety.

In paying any unpaid bills or obligations of the Contractor, the Owner shall be deemed the agent of the Contractor and any payments so made by the Owner shall be considered a payment made under this Contract by the Owner to the Contractor, and the Owner shall not be liable to the Contractor for any such payments made in good faith.

If the moneys retained under this Contract are insufficient to pay the sums found by the Owner to be due under the claims for labor and materials, the Owner may, at his discretion, pay such sums, and the Contractor or his Surety shall repay to the Owner all sums so paid out.

ART. 98- OPERATING TESTS

Prior to and as a requirement for receiving semi-final payment, the Contractor shall conduct all operating tests called for in the specifications, including but not limited to, watertightness tests of piping systems, tests of motorized and pneumatic equipment and their controls, tests of meters, gages and other instruments, tests of all control systems, pump tests and other tests as specified or directed. Testing shall be performed in the presence of the Engineer or his authorized representatives.

In the event that any tests fail to meet the requirements of the specifications, the Contractor shall make alterations, repairs or replacements as required in order that all systems equipment and appurtenances meet the operating tests as specified. The intent of the Contract is to provide a complete installation in accordance with the drawings and specifications, in working order, and ready for operation.

ART. 99- CLEANING UP

The Contractor shall expressly undertake at his own expense:

- a) Frequently to clean up all refuse, rubbish, scrap materials, and debris caused by his operations to the end that at all times the site of the work shall present a neat, orderly, workmanlike appearance;
- b) Before semi-final payment, to remove all surplus material, false work, temporary structures, including foundations thereof, plant of any description, and debris of every nature resulting from his operations and to put the site in a neat orderly condition; and
- c) Before semi-final payment, he shall restore all areas which have been used for storage of materials and equipment, and all areas which have been disturbed by his operations to their original conditions, or to a condition satisfactory to and approved by the Owner. He shall seed or sod any grassed area damaged by his operations (except for delayed seeding as provided in the Contract), and shall maintain such areas until the expiration of the maintenance period. Any such areas which fail to show a uniform stand of grass shall be reseeded or resodded until an acceptable stand of grass exists.

ART. 100- CERTIFICATE OF COMPLETION

Upon completion of all work required, or assigned during the contract period, except maintenance, as explained under "Maintenance", and final pavement, when applicable, the Engineer shall prepare a

Certificate of Completion certifying that all work has been performed and materials supplied in full accordance with the terms of the Contract and that the necessary Products and Completed Operations insurance is in place as required by Article 8. Acceptance of the Certificate of Completion by the Owner shall constitute "acceptance of the work".

After completion and acceptance of the Certificate of Completion by the Owner, the retention previously held, will be reduced as indicated in Article 96.

ART 101- FINAL ESTIMATE AND SEMI-FINAL PAYMENT

Upon completion of all work required, except maintenance, the Engineer shall file with the Owner a "Final Estimate" stating, from actual measurements or observation, the entire amount of work performed and compensation earned by the Contractor, including Extra Work and compensation therefor, under and according to the terms of the Contract. The Owner reserves the right to disregard claims for compensation submitted by the Contractor after the date of final estimate.

Within 45 days after the filing of the final estimate, and provided that the Owner is satisfied that the necessary Products and Completed Operations insurance is in place as required by Article 8, the Owner will pay to the Contractor the amount therein stated, less retainage, and less all prior payments and advances whatsoever to or for the account of the Contractor. All prior estimates and payments shall be subject to correction by this payment, which is throughout this Contract called the semi-final payment. In any event, the semi-final payment will not be released to the Contractor until all outstanding claims against the Contractor shall have been satisfied.

ART. 102- ACCEPTANCE OF SEMI-FINAL PAYMENT CONSTITUTES RELEASE

The acceptance by the Contractor of the semi-final payment shall be and shall operate as a release for all things done or furnished in connection with this work and for every act of the Owner and others relating to or arising out of this work. No payment, however, semi-final or otherwise, shall operate to release the Contractor or his Sureties from any obligations under this Contract or the Contract Bonds.

ART. 103- MAINTENANCE

During a period of one year subsequent to the date of the acceptance of the work by the Owner, or as provided below, the Contractor agrees to replace the material which does not conform to the Contract requirements, and to repair any defects in materials or the work, or to make any changes required without cost to the Owner, to the satisfaction of the Engineer, and in conformity with the Contract Documents, provided that orders for such replacements, repairs or changes are received by him in writing within the one year period. The Contractor is not obligated thereby to do any work of replacement or repair that he may prove, to the satisfaction of the Engineer, to have resulted from abuse of the work, or materials by parties other than the Contractor, after the date when the Owner puts to use that part of the work requiring replacements or repairs, or has approved the Certificate of Completion, and has accepted the work.

If the Owner shall deem it necessary and shall so order, such replacement, changes or repairs shall be undertaken within 24 hours after service of notice. If the Contractor unnecessarily delays or fails to make the ordered replacements, changes or repairs within the time specified, or if any replacements, changes or repairs are of such nature as not to permit the Contractor to undertake them within 24 hours, then the Owner shall have the right to make such replacements, changes, or repairs and the expense thereof shall be paid by the Contractor or deducted from any moneys due the Contractor, or from any moneys of the Contractor retained by the Owner.

If the Owner puts to use for which it is built or installed, any structure or equipment prior to the acceptance of all work under the Contract, the maintenance period for such structure or equipment shall be calculated from the time when such use begins.

ART. 104- SURETY DURING MAINTENANCE PERIOD

The Performance Bond and Labor and Material Payment Bond submitted with the executed contract shall remain in full force and effect for the duration of the maintenance period.

ART. 105- FINAL CERTIFICATE AND FINAL PAYMENT

Twelve months after the acceptance of the work by the Owner, the Engineer shall file with the Owner a "final certificate" certifying that all work has been performed and materials supplied in full accordance with the terms of the Contract and stating therein the amount retained. Upon approval of the final certificate by the Owner, the Owner will pay to the Contractor the amount therein stated.

Final payment, however, will not be released to the Contractor until:

- a) He presents proof that all claims against the Contractor have been satisfied;
- b) He executes and delivers a release substantially in the following form: "In consideration of the above payment we hereby release the Owner and his agents from all claims and liability of whatsoever nature for anything done or furnished or in any manner growing out of the doing of the work."
- c) He secures and files with the Owner statements from Officials that the highway surfaces, if any, under their jurisdiction have been restored satisfactorily.

ART. 106- NO WAIVER OF CONTRACT

Neither an extension of time for any reason beyond the date fixed herein for the completion of the Contract, nor the delivery and acceptance of any articles or materials, nor any payment for, nor acceptance of the whole or any part of the work by the Engineer, or any possession taken by the Owner or its employees or agents, shall be deemed to be a waiver by the Owner of the right to abrogate this Contract for abandonment or delay or non-performance in the manner therein provided, nor shall it operate to void or annul any of the terms of this Contract.

ART. 107- NO ESTOPPEL

Neither the Owner nor any of his officers, shall be precluded or estopped by any certificate made or given by the Owner, the Engineer, or other officer, agent or appointee of the Owner under any provision of this Contract, from at any time (before the completion and acceptance of the work and payment therefor, or before the end of the maintenance period) showing the true and correct amount and character of the work done and materials furnished by the Contractor or any other person under this Contract, or that any such certificate is incorrect or improperly made in any particular, or that the work and materials, or any part thereof, do not in fact conform to the specifications and drawings, and the Owner shall not be precluded or estopped, notwithstanding any such certificate and payment in accordance therewith, from demanding and recovering from the Contractor such damages as it may sustain by reason of his failure to comply with the Contract Documents.

ART. 108- OTHER PROHIBITED INTERESTS

No official of the Owner who is authorized in such capacity and on behalf the Owner to negotiate, make, accept or approve, or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this Contract, in any part hereof. No officer, employee, architect, attorney, engineer or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory, or other similar functions in connection with the construction of the Project shall become directly or indirectly interested personally in this Contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the Project.

ART. 109 - NOT USED

ART. 110- CONFORMANCE WITH MUNICIPAL AND STATE REQUIREMENTS

Prior to commencement of any work, the Contractor shall obtain all permits and approvals required to be acquired by the Contractor by the Town agencies having jurisdiction, utility companies and CONNDOT. These requirements may include, but are not limited to the following:

- Road opening permits

Contractor shall pay all fees, establish escrows and provide insurance and bonds required by these permits and approvals.

All State and local requirement shall be satisfied prior to commencement of work.

ART. 111- EXEMPTION FROM SALES AND COMPENSATING USE TAXES

In computing their bids, bidders are not to include the sales and compensating use taxes of the State or of any city and county in the State on any supplies or materials to be sold to the Owner, which is exempt from such taxes.

GENERAL CONDITIONS

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GENERAL CONDITIONS

ART. 1 - DEFINITIONS

The term "Contract Documents" shall mean and consist of the Advertisement for Bids, Information for Bidders, Proposal, Bidder's Affidavit, executed Contract, General Conditions, General Specifications, Detailed Specifications, Contract Drawings entitled and all addenda thereto and modifications thereof incorporated in the Documents before execution of the Contract.

The term "Owner" shall mean the Brookfield Water Pollution Control Authority, Town of Brookfield, Connecticut, or its duly authorized representative.

The term "Engineer" shall mean Langan CT, Inc., 1 North Broadway – Suite 910, White Plains, New York 10601.

The Term "Contractor" shall mean the party or parties contracting with the Owner to perform a branch of the work herein specified or to the legal representative of such party or parties.

The term "Subcontractor" shall mean the party or parties having a contract or agreement with the Contractor to supply labor or materials, or both, for work at the site of the Project.

The term "Contract Bonds" shall mean the bonds furnished by the Contractor, as security for the faithful performance of his Contract and security for the payment of all persons performing labor or furnishing materials in connection therewith.

The term "Surety" shall mean the person, persons, or corporate body which is bound with and for the Contractor, and which binds itself or himself for the payment of all debts pertaining to, and for the acceptable performance of, the work for which he has contracted.

The term "Project" shall mean the entire work to be performed under the Contract.

The term "Work" or "work" shall mean all plant, labor, materials and supplies (including their transportation to or from the site of the Project by employees of the Contractor or his subcontractors), structures or parts thereof on which work is underway or completed, equipment, rentals, insurance, Contract Bonds, and other facilities and things agreed to be furnished and done by the Contractor, and necessary and proper for or incidental to the carrying out and completion of the terms of this Contract, including all shop and field tests of equipment and structures, operating tests and maintenance for one year.

The term "extra work" shall mean work authorized by the Owner which, by his written direction, involves changes in, or additions to, the work required under the Contract at the time of its execution.

The term "drawings" shall mean the Contract Drawings, all details or working drawings furnished by the Engineer pertinent or supplemental thereto, and such supplemental detail drawings as the Contract Documents may require the Contractor to furnish, when such drawings have been duly approved.

The term "specifications" shall mean the General Specifications, Detailed Specifications, specifications contained in the Contract Items or shown on the drawings, and standard specifications referred to herein.

The term "provide" and/or "furnish" shall mean to supply, deliver, place, install, connect, and make ready for use or for the purpose intended.

The term "completion" shall mean the full and exact compliance and conformance with the provisions and requirements expressed and implied by the drawings, specifications, and Contract Documents.

The term "material" (or "materials") shall mean all the things of any kind, nature, and class as may be specified which become a part of or are used in the construction of the work, together with all manufactured or prepared materials, articles, equipment, accessories, appliances, appurtenances, supplies and parts used therein or placed thereon.

The term "structures" shall mean manholes, conduits, pipe, electrical and other facilities, and other works which are to be built under this Contract or which may be encountered in the work and which are not otherwise classified herein.

The term "site" shall mean the area or areas which is the location for the performance of the work.

When referring to the work or its performance, the words "directed", "required", "permitted", "ordered", "designated", "prescribed", and others of like import, shall imply the direction, requirement, permission, order, designation or prescription of the Engineer; and "approved", "acceptable", "satisfactory", "in the judgment of", and words of like import shall mean approved by or acceptable to or satisfactory to the Engineer. Wherever in the specifications the words "detailed", "noted", "shown", or words of like import are used, it shall be understood that these words mean as detailed, noted, or shown on the drawings; and where the word "specified" is used, it shall be understood to mean as specified herein.

Whenever any article of equipment or material is specified by reference to the name of a manufacturer or dealer without the use of the terms "equal to", or "approved equal", the intent is to specify that equipment or material shall be the basis for the bid submitted in the proposal.

ART. 2 - HEADINGS

The headings of the articles herein are intended for convenience of reference only and shall not be considered as having any bearing on their interpretation.

ART. 3 - EXECUTION, CORRELATION AND INTENT OF DOCUMENTS

The Contract Documents shall be signed in quadruplicate by the Owner and the Contractor.

The Contract Documents are complementary, and what is called for by one shall be binding as if called for by all, The work herein described and/or shown on the drawings shall be complete in every detail notwithstanding that every item necessarily involved is or is not particularly mentioned or shown, and the Contractor will be held to provide all labor, materials, equipment and incidental accessories necessary for the entire completion of the work intended to be described or shown in finished form, tested and ready for operation, and shall not avail himself of any manifestly unintentional error or omission, should such exist.

Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and this Contract shall be read and enforced as though it were included herein, and if through mere mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party hereto, the Contract shall forthwith be physically amended to make such insertion.

If this Contract contains any unlawful provisions not an essential part of the general structure of the Contract and which shall not appear to have been a controlling or material inducement in the making thereof, the same shall be deemed of no effect and shall be deemed stricken from the Contract without affecting the binding force of the remainder.

ART. 4 - CONTRACT SECURITY

Simultaneously with delivery of the executed Contract, the Contractor shall furnish and deliver to the Owner in quadruplicate an executed Performance Bond and Labor and Material Payment Bond, each in the amount of one hundred percent (100%) of the accepted bid as security for the faithful performance of his Contract, and in the amount of one hundred percent (100%) of the accepted bid as security for the payment of all persons performing labor or furnishing materials in connection therewith, prepared in a form and having as security thereon such Surety or Sureties as are acceptable to the Owner, are authorized to transact business within this State, and have at least an A Minus rating from A.M. Best & Company. The bonds shall be purchased through a surety company having a local agent upon whom service of process can be made. The bonds shall assure the Owner coverage for a one year maintenance period subsequent to completion of work.

If, at any time after execution and approval of this Contract and the Bonds required by the Contract Documents, the Owner shall deem any of the Sureties upon such bonds to be unsatisfactory, or if, for any reason, such bonds shall cease to be adequate security for the Owner, the Contractor shall, within five (5) days after notice so to do, furnish new or additional bonds, in forms, sums and signed by such Sureties as shall be satisfactory to the Owner. No further payment shall be deemed due nor shall any further payment be made to the Contractor unless and until such new or additional bonds shall be furnished and approved. The premium on such bonds shall be paid by the Contractor.

ART. 5- BREAKDOWN STATEMENT OF LUMP SUM BIDS

Simultaneously with his delivery of the executed Contract, the Contractor shall furnish and deliver to the Owner triplicate copies of a breakdown statement of his lump sums bid in the Proposal, in such detail and form as will be acceptable to the Engineer, for use in preparing the monthly estimates. The breakdown shall show the delivered price of material and the allowance for installation, which may be enumerated in any monthly estimate for payment as provided here-in-under; and shall be so made as to facilitate the preparation of monthly estimates.

ART. 6- OBLIGATION OF CONTRACTOR

The Contractor shall, under the bid prices, furnish all labor, materials, plant, power, light, heat, fuel, water, tools, appliances, equipment, supplies, and any and all other means of construction necessary or proper for performing and completing the work; restore to their original condition all surfaces disturbed; do all work and pay all costs of cutting, fitting, patching, protecting, supporting, maintaining, repairing if damaged, relocating and restoring all surface, subsurface and overhead structures, and all other property, including the work of other contractors, and pipe, conduits, ducts, tubes, chambers, and appurtenances, public or private in the vicinity of the work; bear all costs of insurance; bear all losses due to the nature of the work and costs incidental to suspension or discontinuance of the work, except as herein provided; take all risks of whatever nature; indemnify the Owner for all claims, as herein provided; conform to all federal, state, county, or municipal legislation and requirements; undertake all cutting, fitting, or patching of his work required to bring it into conformity with the Contract Documents; leave intact the work of adjoining contractors, unless otherwise ordered; perform and complete the work, including all operating tests, to the satisfaction of the Engineer, and in the manner best calculated to promote rapid construction and consistent with safety of life and property, and in strict accordance with the Contract Documents; protect the work during construction; clean up the work during and after construction; and maintain it until final acceptance and as provided hereinafter under "Maintenance."

The Contractor will supervise and direct the work efficiently and with his best skill and attention. He will be solely responsible for the means, methods, techniques, sequences, safety measures, and procedures of construction. It is understood that neither the Owner nor the Engineer are responsible for the adequacy of construction methods or for the safety of Contractor's personnel. Neither the action nor

inaction of the Owner or the Engineer shall make them liable for injury or damage resulting from inadequate or improper construction methods.

The Contractor shall hold harmless, defend and indemnify the Owner, the Town of Brookfield and the Engineer, their agents, officers and employees, from and against any and all claims, damages, losses and expenses, including attorney's fees, arising out of the performance of this contract caused in whole or in part by any act or omission of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or for whose acts any of them may be liable except where such claim, damage, loss or expense is caused by the active and sole negligence or willful misconduct of such Owner, Town or Engineer.

It is intended that the unit prices and lump sum bids include all the work to be done which will result in a complete installation of first class workmanship and material ready for operation, and that any appurtenance, accessory, or work allied to any particular item of work and necessary for its proper operation or completion will be furnished and installed under the unit prices and lump sums or lump sum bid under this Contract.

ART. 7- START AND COMPLETION OF WORK

The Contractor shall commence work within ten (10) days from the date of receipt of a written notice from the Owner to commence work, and shall continue without interruption until work is completed, except as provided herein. The sequence of work shall conform to the construction program submitted by the Contractor and approved by the Engineer, provided however, that said schedule may be modified from time to time as directed or approved by the Engineer.

Modification of the schedule or sequence of construction by the Engineer shall not entitle the Contractor to extra compensation other than mobilization and demobilization costs, and only if such costs are in excess of normally anticipated costs as determined by the Engineer.

The Contractor shall complete the work in all respect, except for maintenance, within the number of consecutive calendar days stipulated in the Contract following the service of notice from the Owner to commence work.

ART. 8- CONTRACTOR'S AND SUBCONTRACTOR'S INSURANCE

The Contractor and each subcontractor shall carry and maintain at all times during the term of this Contract such insurance as hereafter specified as will protect such party, the Owner, the Town of Brookfield and the Engineer from claims for damages for bodily injury, including accidental or wrongful death, as well as claims for property damage, which may arise from operations under this Contract whether such operations be by such Contractor, by any subcontractor or by anyone directly or indirectly employed by such party. A subcontractor may be excused from coverage only if he is a named insured on the prime contractor's policy or policies.

The Contractor shall purchase and maintain such insurance with companies having a minimum A Minus rating from A.M. Best & Company, which are also satisfactory to the Owner.

The Owner, the Town of Brookfield and the Engineer, shall be named or endorsed as an Additional Insured on all policies of insurance except statutory Workers Compensation insurance. Each such policy shall waive right of recovery (waiver of subrogation) against the Owner, the Town of Brookfield and the Engineer.

The Contractor shall indemnify, save harmless and defend the Owner, the Town of Brookfield and the Engineer, their agents, officers and employees, from any and all claims and damages arising out of the performance of this Contract as more specifically provided in Article 6. The forms or amounts of insurance to be furnished by the Contractor and each subcontractor shall not operate to relieve or limit the liability of the Contractor or its subcontractors as otherwise set forth in the Contract Documents.

All of the insurance to be provided shall be considered to be primary and non-contributory insurance as respects the Owner, the Town of Brookfield and the Engineer.

The Contractor shall not commence work under this Contract until the Contractor has obtained all insurance required and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor has been obtained and approved. Notwithstanding the foregoing, the Owner's approval or failure to approve the insurance required hereunder shall not serve to relieve or decrease the liability of the Contractor for claims and damages arising out of the performance of this Contract by the Contractor or any of its subcontractors..

Prior to execution of the Contract, Contractor shall furnish the Owner with original Certificates of Insurance from the insurance carrier(s) in quadruplicate stating the type of coverage, the limits of liability and the expiration date for each policy. In addition, Contractor shall furnish the Owner with a copy of the Declarations and Endorsement Page(s) for the Commercial General Liability Policy listing all policy forms and endorsements. Owner's failure to obtain or approve the required documents prior to contract execution or commencement of the Work shall not waive Contractor's obligation to provide such documents. The Owner reserves the right to require Contractor to provide complete, certified copies of all insurance policies, including endorsements, required by this Article, at any time.

Each policy of insurance shall be endorsed to include a provision, and the certificate of insurance shall indicate, that the Owner will receive not less than 30 days written notice (10 days if cancelled due to non-payment) if the insurance is terminated or canceled prior to the expiration date of the policy.

The Contractor shall keep all of the required insurance in continuous effect during the life of the Contract and in the case of Products and Completed Operations coverage, for a period of three (3) years following acceptance of the Work. Renewal certificates covering the renewal of all policies expiring during the life of the Contract shall be filed with the Owner not less than 10 days before the expiration of such policies. In addition, if there is a cancellation of any insurance or a change to the limits of liability or coverage, the Contractor shall notify the Owner and the Engineer immediately and shall submit a new insurance certificate to the Owner and Engineer providing for replacement insurance. It is the responsibility of the Contractor to maintain evidence of current insurance coverage with the Owner for the duration of contract.

The amounts of insurance coverage required hereunder may be provided under a combination of primary and excess (umbrella) policies.

The Contractor and each sub-contractor shall carry and maintain at all times during the term of this Contract the following insurance coverages:

1. **Workers' Compensation Insurance:** With respect to all operations the Contractor performs and all those performed for it by subcontractors, the Contractor shall carry, and require each subcontractor to carry, Workers' Compensation insurance as required by the laws of the State of Connecticut. Such insurance shall be provided in amounts not less than \$100,000 per accident for bodily injury by accident; \$100,000 policy limit by disease and \$100,000 per employee for bodily injury by disease, or such higher amounts as may be required by State law.

2. **Commercial General Liability Insurance:** With respect to the operations the Contractor performs, the Contractor shall carry, and require each subcontractor to carry, Commercial General Liability insurance, including Contractual Liability, Products and Completed Operations, Broad Form Property Damage and Independent Contractors coverages.

Coverage shall be on an "occurrence" basis.

Each such policy shall have coverage for and exclusions removed for "Explosion, Collapse and Underground" ("XCU").

Coverage shall include contingent liability coverage to protect the Contractor and Owner, Town of Brookfield and Engineer as Additional Insureds against claims arising from the operation of Subcontractors. Such coverage may be provided as to subcontractors by Endorsement CG 20 38 04 13 Additional Insured – Owners, Lessees or Contractors – Automatic Status For Other Parties When Required In Written Construction Agreement, or equivalent. This coverage may be waived if there will be no subcontractors on the project.

Products and Completed Operations insurance for ongoing and completed operations shall be maintained for a period of not less than three (3) years following the acceptance of the Work. If such coverage is not furnished initially, it must be provided by the furnishing of a separate site specific policy of insurance prior to acceptance of the Work and semi-final payment by the Owner as provided for in Articles 100 and 101.

Such insurance shall fully insure against the Contractor's (or subcontractor's) liability for bodily injury and property damage with combined bodily injury (including death) and property damage minimum limits of

\$5,000,000 per occurrence / all insured limit
\$2,000,000 personal injury and advertising injury limit
\$5,000,000 completed operations aggregate / all insured

The aggregate limits must apply solely to this Work and Project and Endorsement CG 25 03 03 97 Designated Construction Project(s) General Aggregate Limit or equivalent must be endorsed to the policy.

3. **Automobile Liability Insurance:** The Contractor shall carry, and require each subcontractor to carry, automobile liability insurance covering the operation of all motor vehicles, including those hired or borrowed, that are used in connection with the Project for all damages arising out of: (a) bodily injury to or death of all persons and/or (b) injury to or destruction of property in any one accident or occurrence.

Such policy shall have a minimum combined limit for bodily injury (including death) and property damage of \$5,000,000. No aggregate limitation shall be permitted.

4. **Builder's Risk Insurance:** If this Project involves the construction of any structure or building requiring issuance of a building permit or a certificate of occupancy (C.O.) or a certificate of compliance (C.O.C.) by the Building Official following completion, then in such event, the Contractor shall procure and maintain during the life of the Contract, Builder's Risk (Completed Value) insurance providing coverage for that portion of the Work involving such construction, including all fixtures, machinery and equipment to be included within such structure or building and including, any heating, cooling or equipment constituting a permanent part of such structure or building and shall cover portions of work located away from the site, but intended for use at the site of such construction.. The insurance shall be written on a broad all risks of

loss policy form including without limitation collapse, flood, earth movement in an amount equal to 100% of the "completed value" of such structure or building. The Engineer shall determine the "completed value" of the work to be protected by such insurance based upon the Project bid or the Engineer's reasonable cost estimate, whichever is higher. The Owner shall be named as Loss Payee.

ART. 9- CONSTRUCTION PROGRAM

Following award of his Contract, the Contractor shall attend a Project conference arranged by the Owner which will include representatives of the Owner, the Engineer, and all other contractors doing work on or about the site.

Within 10 days after notice to proceed with the work, the Contractor shall prepare and submit for approval six copies of a detailed chronological construction program or work progress schedule, setting forth clearly each stage including approximate delivery dates of materials, and the time allowed for the installation of materials, in order to complete all the work fully within the time fixed herein, and, if required, he shall revise and resubmit the program until it is approved. Confirmed delivery dates for materials shall be furnished as soon as practicable after the submission of the construction program.

The Critical Path Method will be permissible in preparation of the construction program, which must be adjusted and updated through a monthly narrative submission.

The Contractor, within 7 days after being notified of an unsatisfactory program, shall resubmit a revised program for approval. If, subsequent to the initial approval, unforeseen circumstances necessitate a modification of the approved construction program, as determined by the Engineer, the Contractor, within 7 days after such notification, shall submit a revised program for approval.

The Contractor shall adhere to such program, and, if necessary to do so, he shall supply, without increased cost to the Owner, additional labor and/or additional shifts of labor and overtime, and procure materials and equipment more promptly.

The Engineer shall have the right to order the Contractor to prosecute the work simultaneously at and from as many different points or parts as the Engineer may deem necessary to assure completion within the Contract time, or to assure minimum interference with the public. Failure to comply with any such work order shall constitute a breach hereof.

The Contractor shall also submit, with such construction program, his plans for plant and his specifications covering methods of construction and of handling materials which he proposes to use in the performance of work. Approval, however, of any proposed plans of plant and such specifications shall not be deemed to relieve the Contractor of any liability or responsibility placed upon him by this Contract or by law.

ART. 10- NOT USED

ART. 11- ACCEPTANCE OF DRAWINGS AND SPECIFICATIONS

The Contractor admits and agrees that he is satisfied with the drawings and specifications and agrees that he will at no time dispute or complain that there was any misunderstanding or any error in regard to the amount, quantities, materials to be furnished, and of the work to be done under this Contract, or in regard to the amount of compensation to be paid therefore; and he further covenants and agrees to completely execute and perform his Contract and to fully complete the said work or improvements to the satisfaction of the Owner and to strictly comply with these drawings and specifications and not to ask or demand, sue for or recover any further or extra compensation beyond the Contract price. He also further covenants and agrees that the Owner may accept any alternate listed at the time of submitting his proposal for the price set therein during the life of the Contract. It is intended that all said prices shall be the sole

and only compensation to the contractor for the full and complete performance of this contract, and the full completion of said Contract or improvement. It is also understood and agreed that the price to be paid includes payment for all labor, materials, tools, equipment and permits therefor.

The Contractor accepts the drawings and specifications as complete and accurate and agrees that there is no conflict therein with permissible trade practices or methods. Any objections to the drawings and specifications that the Contractor may have must be called to the Engineer's attention and the matter resolved before submitting his Proposal.

The Contractor agrees that should there be conflicts or objections not called to the Engineer's attention and written decision rendered by the Engineer before signing the Contract the Engineer's decision with regard to such conflict or objection shall be final and binding on the Contractor.

ART. 12 - OMISSION OF DETAILS IN DRAWINGS AND SPECIFICATIONS

All work called for in the specifications applicable to each separate Contract, but not shown on the drawings in their present form, or vice versa, and work not specified in either the drawings or in the specifications, but involved in carrying out their intent, or in the complete and proper execution of the work, shall be performed by the Contractor as though it were specifically delineated or described.

The apparent silence of the specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only the best material and workmanship is to be used; and interpretation of these specifications shall be made upon that basis.

ART. 13 - CONFLICTS ON DRAWINGS AND SPECIFICATIONS

In case of any conflict or inconsistency between the drawings and specifications, the matter shall be submitted by the Contractor to the Engineer, whose decision thereon shall be conclusive and binding on the Contractor as if same were specifically set forth in the Contract, and unless he shall have asked for and obtained a decision in writing from the Engineer before submitting his Proposal as to what shall govern, the Contractor shall be deemed to have estimated on the more expensive way of doing the work.

Any discrepancy between the figures on drawings shall be submitted by the Contractor to the Engineer, whose decisions thereon shall be conclusive and final.

When any detail of construction is not fully understood by the Contractor, he shall make application to the Engineer for such additional instructions as may be necessary and the Engineer's decision shall be final. In no case shall he proceed without such instructions.

Should anything be omitted from the drawings or specifications which is necessary to a clear understanding of the work, or should any errors appear either in any of the drawings furnished or in the work done by other contractors affecting the work included under this Contract, the Contractor shall promptly notify the Engineer of such omission or errors and in event of the Contractor's failure to do so, he shall make good any damages to or defect in his work caused thereby. He will not be allowed to take advantage of any error or omission on the drawings, as full instructions will be furnished by the Engineer, should such error or omission be discovered, and the Contractor shall carry out such instructions as if originally specified.

Errors in the specifications and/or drawings which are purely typographical shall be interpreted as would be the logical conclusion or brought to the attention of the Engineer for interpretation.

The Contractor is required to check all dimensions and quantities on the drawings or schedules given to him by the Engineer, and shall notify the Engineer of all errors therein which he may discover by

such examination and checking. The Contractor will not be allowed any extra payment for work he alleges to be due to any error or omission in these specifications, nor in the drawings or schedules, as full directions will be furnished by the Engineer should such error or omission be discovered, and the Contractor shall carry out such instructions as if originally specified.

Figured dimensions on drawings shall take precedence over measurement by scale and detailed working drawings shall take precedence over general drawings and shall be considered as explanatory of them and not as indicating extra work.

ART. 14- DRAWINGS, DIAGRAMMATIC REPRESENTATION

Where drawings are shown in diagrammatic form they are intended to convey scope of work and to indicate general arrangement of equipment, ducts, conduits, piping and fixtures.

Locations of all items, shown on drawings or called for in specifications that are not definitely fixed by dimensions are approximate only. Exact locations necessary to secure the best conditions and results shall be submitted to the Engineer for approval before installation.

When directed by the Engineer, reasonable modifications in layout shall be made as required to prevent conflict with work of other trades or for proper execution of work, without additional cost to the Owner.

ART. 15- STANDARD SPECIFICATIONS AND ABBREVIATION

Where reference is made in the Contract Documents to the standard specifications of any technical society, Federal Specification Board, or other recognized organization, these shall be construed to mean the latest standard adopted and published at the date of advertisement for bids and such specifications are made part hereof to the extent which is indicated.

The following abbreviations are used throughout the specifications to refer to organizations publishing specifications that are widely accepted as standards:

AASHTO	American Association of State Highway and Transportation Officials
ACI -	American Concrete Institute
AGA -	American Gas Association
AGMA -	American Gear Manufacturers Association
AHDGA-	American Hot Dip Galvanizing Association
AIEE -	American Institute of Electrical Engineers
AISC -	American Institute of Steel Construction
AISI -	American Iron and Steel Institute
AMCA -	Air Moving and Conditioning Association
ANSI -	American National Standards Institute
ASCE -	American Society of Civil Engineers
ASHRAE-	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME -	American Society of Mechanical Engineers
ASTM -	American Society for Testing and Materials
AWPA -	American Wood Preservers' Association
AWS -	American Welding Society
AWWA -	American Water Works Association
F.S. -	Federal Specifications
IBR -	Institute of Boiler and Radiator Manufacturers
IEEE -	Institute of Electrical and Electronic Engineers
IPCEA-	Insulated Power Cable Engineers Association
NBFU -	National Board of Fire Underwriters (American Insurance Association)

NEC -	National Electrical Code
NEMA -	National Electrical Manufacturer's Association
SBI -	Steel Boiler Institute
SSPC -	Steel Structures Painting Council
UL -	Underwriters Laboratories, Inc.

ART. 16 - DATUM

The figures given in the Contract and specifications or upon the Contract Drawings after the word "elevation" or an abbreviation of it, shall mean distance in feet above United States Coast and Geodetic Survey Datum, for mean sea level.

ART. 17- DRAWINGS AND SPECIFICATIONS TO BE FURNISHED TO CONTRACTOR

The Contractor will be furnished with four white prints on paper, of each of the numbered drawings and a title sheet, and four sets of specifications. Additional prints and specifications will be furnished the Contractor upon application, at cost of reproduction.

Where a revision of a drawing becomes necessary, four copies of only the revised drawing will be furnished to the Contractor for inclusion with the previously issued drawings.

Supplementary drawings will be issued by the Engineer to the Contractor from time to time, where the Contract Drawings require supplementing, to explain the work more fully or to show changes which have been ordered by the Owner. Four white prints on paper, of each supplementary drawing will be furnished to the Contractor. These supplementary drawings shall have the same force and effect as any other Contract Documents.

The Contractor shall keep one (1) copy of all drawings and specifications including the latest revised drawings and supplementary drawings, at the job site, in good legible condition, available to the Engineer and to his representatives.

ART 18 – RE-USE OF DRAWINGS AND SPECIFICATIONS

All drawings, specifications and copies thereof furnished by the Engineer are not to be used on any other work.

ART 19 - ENGINEERING REPRESENTATION

During the life of the Contract, there will be representation by the Engineer and his authorized agents who will define the meaning and intent of the drawings and specifications, pass upon materials and workmanship, and determine that the work is proceeding in accordance with the Contract Documents. He may reject such work as in his opinion is not in accordance with the drawings and specifications.

The Engineer's representation is for the purpose of assuring that the work described by the drawings and specifications is being properly executed. If an Engineer's field representative is employed he shall act as the Engineer's agent, serve as liaison between the Engineer and the Contractor generally through the Contractor's field superintendent, conduct on-site observations and keep records of the work in progress, give assistance in interpreting the drawings and specifications, transmit orders by the Engineer to the Contractor, review applications by the Contractor for payment, conduct final inspection of the work in the company of the Engineer and the Owner and perform other field representative duties as required.

Neither the Engineer, his field representative, or other authorized agents shall authorize any deviation from the Contract Documents without the knowledge and consent of the Owner, nor undertake any of the responsibilities of the Contractor, his subcontractors, or his field superintendent, nor expedite or superintend the Contractor's work, nor advise on or issue directions relative to any aspect of

construction technique or method unless such technique or method is called for in the drawings and specifications.

The Engineer and his authorized agents shall have authority to stop the work of the Contractor whenever such stoppage is necessary to insure compliance with the Contract Documents.

The Engineer shall judge as to what constitutes a reasonable notice, and whether or not workmanship or materials incorporated in the work meet the standards and intent of the drawings and specifications, or of the kind of quality of materials that must be submitted to the Engineer for approval. His decision as to these questions must be accepted as final.

ART. 20 - INSPECTION

The Engineer, his authorized agents, or the Owner will inspect materials furnished and the work done under this Contract, and he is also hereby authorized and empowered to reject and refuse all work; materials and equipment, and the method of application of any part thereof, under or in fulfillment of this Contract, that does not comply in kind, quality, quantity, time, place or performance, with the specifications and the drawings. The inspection, approval or acceptance of any part of the work herein contracted for, or the materials used therein, or any payment on account thereof, shall not prevent the rejection of said work or materials at any time thereafter during the existence of this Contract and prior to the final payment should said work or materials be found to be defective or not in accordance with the requirements of the drawings and specifications.

Inspection, test, or acceptance of any materials prior to shipment shall not be deemed as a final acceptance of the materials. The Engineer may inspect or require tests or analyses of any portion of the materials at any time, after delivery at the site of work, either before or after installation, and any material which is found to be defective or which does not otherwise conform to the requirements of the specifications shall be rejected and removed forthwith from the site of the work, as provided in the Contract.

The Contractor will be required to pay for all costs of engineering field work and inspection which is:

- (a) Performed on Saturdays, Sundays, or legal holidays, and which is made necessary by the Contractor's operations on such days and
- (b) Performed between the completion date specified and the actual completion of the Contract, regardless of whether or not an extension of time may be approved.

ART. 21 - ACCESS TO WORK

Agents, authorized representatives, and employees of participating Federal Agencies, the State, the Owner, and the Engineer, shall for any purpose have access to the work and the premises used by the Contractor, and the Contractor shall provide safe and proper facilities therefor, including ladders and scaffolds. Other parties who may enter into contracts with the Owner for doing work within the territory covered by this Contract, shall, for all purposes which may be required by their contracts, be accorded the rights of access to the site of those parts of the work for which they are under contract.

Furthermore, the said agencies, the Owner, the Engineer, and their inspectors and agents shall, at all times, have immediate access to all places of manufacture where materials are being made for use under this Contract and the Contractor shall provide full facilities for determining that all such materials are being made strictly in accordance with the specifications and drawings. Records of payrolls, personnel, invoices, bills of lading and other relevant data shall also be made available by the Contractor for inspection upon request.

ART. 22 - PERSONAL LIABILITY

In carrying out the provisions of this Contract or in exercising any power or authority granted them by their position there shall be no liability upon the appointed officials, the Engineer or their authorized representatives or assistants, either personally or as officials of the Owner, it being understood that in such matters they act as agents and representatives of the Owner.

ART 23 - TESTING OF MATERIALS

If the Engineer so requires, either prior to, beginning, or during the progress of the work, the Contractor shall submit samples of materials for such special tests and analyses as may be necessary to demonstrate that they conform to the specifications. The Owner will select and pay for testing laboratories to perform tests and analyses on concrete aggregates, mixed and placed concrete and similar materials. Such samples shall be furnished, taken, stored, packed, and shipped as directed at the expense of the Contractor.

The Contractor shall submit data and samples, or place his orders, sufficiently early to permit consideration, inspection, testing, and approval before the materials and equipment are necessary for incorporation in the work. Any delays resulting from his failure so to do shall not be used as a basis of a claim against the Owner or the Engineer.

If the Engineer orders sampling and analyses or tests of materials which are usually accepted on certification of the manufacturer but which appear defective or not conforming to the requirements of the specifications, the Owner will bear the costs of tests and analyses if material is found to be sound and conforming to the specifications; if found defective or not conforming to the specifications, the Contractor shall bear all of the costs.

ART. 24 - CERTIFICATES OF MANUFACTURERS

For pipe, cement, steel reinforcement, paint and similar materials which are normally tested in the shop by the manufacturer, the Contractor shall furnish the Engineer certified records of physical, chemical, and other pertinent tests, and/or certified statements from the manufacturer that the materials have been manufactured and tested in conformity with the specifications. Where such a small quantity of material is required as to make physical tests or chemical analyses impractical, a certificate from the manufacturer stating the results of such tests or analyses of similar materials which were concurrently produced, may at the discretion of the Engineer, be considered as the basis for the acceptance of such materials.

ART. 25 - DEFECTIVE WORK OR MATERIALS

The inspection of the work by the Engineer or Owner shall not relieve the Contractor of any of his obligations to fulfill his Contract as herein prescribed and defective work shall be made good, and unsuitable materials may be rejected, notwithstanding that such work and materials may have been previously inspected by the Engineer or Owner and accepted or estimated for payment.

If at any time before the final acceptance of the work, materials or workmanship should be discovered which do not comply with the specifications and drawings, they shall be immediately removed by the Contractor when notified to do so by written notice from the Engineer or Owner and shall be replaced at the Contractor's expense. Any work rejected by the Engineer or Owner as unsuitable or improperly done shall be removed and repaired, or otherwise remedied, as the Engineer or Owner may direct.

Any material rejected by the Engineer or Owner shall be removed from the site of the work within two days if and after notice to that effect is given.

Should defective work be suspected and the Engineer or Owner so require, the Contractor shall uncover, take down or make openings in the finished work for the purpose of examining at such points as said Engineer or Owner designates.

Should the work thus exposed or examined prove satisfactory, the uncovering, taking down or making openings in and replacing of the covering or the making good of the parts removed shall be paid for in accordance with the contract unit prices and/or as provided hereinafter under "Extra Work and Changes in the Work", for the items involved; but should the work exposed or examined prove unsatisfactory, the uncovering, taking down, replacing and making good shall be at the expense of the Contractor. However in no event shall the Owner pay for any costs of uncovering and covering work where the Contractor has covered the work without its being inspected by the Owner or the Engineer.

If the Contractor shall fail or neglect to replace any defective work or to discard rejected materials within 10 days after the service by the Engineer of an order to replace such defective work or discard such materials, or to prove to the satisfaction of the Owner that he is initiating effective efforts to replace defective materials, the Owner may cause such defective work or materials to be replaced or removed, and acceptable materials provided, and the expense thereof shall be deducted from the moneys as are or may become due under this Contract, or if such moneys are not sufficient to meet said expense the additional moneys shall be furnished by the Contractor or his Surety. If during the maintenance period provided for hereinafter, any work done in accordance with that article shall be found defective before the end of the maintenance period; such defective work shall be made good in the same manner as provided herein. The Owner will have the option at all times to allow the defective or improper work to stand and to accept an equitable deduction from the Contract Price therefor.

ART. 26 - WEIGHING AND MEASURING

Whenever requested by the Engineer, the Contractor shall provide personnel and all required weighing and measuring devices for determining the quantity of materials. For estimating quantities in which the computation of areas by geometric methods would, in the opinion of the Engineer, be comparatively laborious, it is stipulated and agreed that the planimeter shall be considered an instrument of precision adaptable to the measurements of such areas.

ART. 27 - DRAWING AND PRINTED MATTER FURNISHED BY THE CONTRACTOR

After approval of the list of manufacturers, the Contractor shall submit for approval, working drawings and shop drawings and descriptions of all materials and equipment which he is to furnish such as steel reinforcement, structural details, layout and support of sheeting and bracing, wiring, and details of supporting and relocating utilities or other adjacent structures, if he intends to deviate from the details shown or if the details are not shown. The Contractor, on approval of the Engineer, may submit manufacturers' literature as a substitute for, or supplement to, the shop drawings. The minimum size for any submission shall be 8 1/2 inches by 11 inches. All drawings and printed matter submitted shall clearly indicate the section of the Contract Items to which they correspond (e.g. G 2.08). Erection drawings may also be required.

Drawings or printed matter shall give all dimensions and sizes to enable the Engineer to consider the suitability of the material or layout for the purpose intended. The working drawings shall, where needed for clarity, include outline and sectional views, and detailed working dimensions and designations of the kind of materials and the kind of machine work and finish required. Drawings for submission shall be coordinated by the Contractor with the drawings heretofore approved, and with the design and function of any equipment or structure. All measurements shall be field checked by the Contractor, who shall not rely on the contract drawings for any dimension that can be measured in the field.

Material shall not be purchased or fabricated for equipment or structures until the Engineer has reviewed the working drawings, which shall represent all materials and work involved in the construction. No materials or equipment shall be delivered to the site until working drawings have been reviewed.

Work shall not be done upon any part of a structure, the design or construction of which is dependent upon the design of equipment or other features, until a review has been made by the Engineer.

Six copies of drawings and printed matter shall be submitted to the Engineer for review. Upon review by the Engineer, the Contractor shall furnish the Engineer with four prints on paper of each approved drawing, and four copies of approved manufacturer's printed literature. Only drawings which have been checked and corrected by the material fabricator shall be submitted. The Contractor shall be responsible for the prompt submission of all working drawings, so that there shall be no delay in the work due to the absence of such drawings.

All shop drawings submitted must bear the approval stamp of the Contractor as evidence that the drawings have been first checked by the Contractor. Any drawings submitted without this stamp of approval will not be considered and will be returned to the Contractor for resubmission. If the shop drawings show variations from the requirements of the Contract Documents because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in his letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment; otherwise the Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract Documents even though such shop drawings have been reviewed.

Where a shop drawing as submitted by the Contractor indicates a departure from the Contract, which the Engineer deems to be a minor adjustment, in the interest of the Owner not involving a change in Contract price or extension of time, the Engineer will review the drawing but such review implies the following:

"The modification shown on the attached drawing has been reviewed in the interest of the Owner to effect an improvement for the Project and is accepted with the understanding that it is subject generally to all Contract stipulations and covenants; and that it is without prejudice to any and all rights of the Owner under the Contract and bond or bonds."

Where additional working drawings are required, the Contractor shall submit same upon the request by the Engineer.

Any review or lack of same by the Engineer of such working drawings, manufacturer's literature or other data related to the work or material to be furnished for the Contract shall not be construed as in any way relieving the Contractor from his full responsibilities under the terms of the contract.

ART. 28 – NOT USED

ART. 29 - PATENTS AND ROYALTIES

The Contractor shall indemnify and save harmless the Owner and his officers and agents, from all damages, judgment, claims and expenses arising from the infringement of any letters of patent, or patent right or because of any royalty, fee or license for the use, arrangement or operation of any tools, machinery, appliances, devices, materials, process or processes which may be used by the Contractor or furnished by him in fulfillment of the requirements of this Contract. In the event of any claim or action at law on account of such patents or fees, it is agreed that the Owner may retain out of moneys which are or which may become due the Contractor under this Contract, a sum of money sufficient to protect himself against loss, and to retain the same until said claims are paid or satisfactorily adjusted.

ART. 30 - DESIGN OF EQUIPMENT

All parts of the equipment furnished under the Contract shall be amply proportioned for all stresses that may occur during fabrication, shipment, erection, and intermittent or continuous operation. Identical parts shall be interchangeable.

The equipment to be furnished under the Contract shall be of an approved type, and the product of manufacturers who have successfully built equipment of the same size, capacity, and type for at least 5 years unless otherwise specified. The Contractor shall submit any information that the Engineer may consider necessary in order to determine the ability of the manufacturer to produce the equipment as called for by the specifications.

Unless other specific requirements are noted under the Contract Items, the Contractor shall provide the services of an accredited representative of the manufacturer to supervise the installation, testing and placing of equipment in satisfactory operation. This representative shall also make final adjustments and shall instruct designated employees of the Owner in the proper operation and maintenance of the equipment.

The Contractor shall obtain from each manufacturer a warranty for equipment replacement and repair in the event of malfunction, which shall extend for one year from the date of "acceptance of the work".

The minimum manufacturing experience requirement is for five years, as specified herein. In other sections of the Contract Documents, manufacturers are required to "have regularly engaged in the manufacture and installation of comparable systems". In all such cases, consideration will be given to alternative equipment which does not meet the specified experience period if the equipment supplier or manufacturer provides a bond from acceptable surety, or a cash deposit, for the value of the equipment being supplied, plus installation costs, removal costs, overhead and profit. The bond or deposit shall be maintained for a period of time equal to the experience period specified and must be available as a guarantee for replacement within thirty days after declaration by the Engineer that the alternative equipment has failed to meet with specified requirements. All such alternative equipment must be submitted to the Engineer for review so as to assure that all technical requirements are met.

The manufacturer's nameplate, name or trademark shall be permanently affixed to all equipment and material furnished. Nameplate of subcontractor or distributor will not be acceptable.

The Contractor shall furnish and install identifying tags and nameplates on all equipment, valves, ducts, dampers, motors, heating and ventilating and electrical work, bearing name and number indicated on the drawings and the function. Unless otherwise specified, tags shall be Seton Name Plate Co. aluminum type with black enamel background and etched or engraved aluminum lettering, or laminated Bakelite or Lamicold.

Nameplates shall be secured with screws, or nuts and bolts where possible, or wired securely elsewhere. The Contractor shall furnish four copies of a list of all nameplates and their location.

ART. 31 - GREASE FITTINGS AND LUBRICATION

The Contractor shall ensure that all grease fittings on each piece of equipment furnished under the Contract are standardized so that only the "Alemite" button-head type of fitting is utilized, except as otherwise specified or required. Fittings shall be standard or giant size according to the type of service performed.

The Contractor shall furnish and use, for each piece of equipment, the type of lubricant recommended by the manufacturer of the equipment. He shall furnish a schedule, in triplicate, listing the

type, frequency of application, and manufacturer of the lubricant recommended for each piece of equipment. At the time of turning the installation over to the Owner, the Contractor shall furnish one year's supply of each type of lubricant in unopened containers.

ART. 32 - SPARE PARTS, SERVICING TOOLS, MANUALS AND PARTS LISTS

Each piece of equipment shall be furnished with a dozen lot assortment of keys, bolts, nuts, lock washers and pins, in tagged sacks. Each piece of equipment having shear pins shall be furnished with two dozen shear pins of each size used, in tagged sacks. Each piece of equipment having leather or rubber washers shall be furnished with two extra washers of each size and material required.

The Contractor shall furnish, with each piece of equipment, the complete set of tools including three sets of spare bulbs and fuses normally furnished by the manufacturer for the servicing of the equipment.

Each major piece of equipment shall be furnished with the spare parts listed in the specifications for the equipment or, if no such list is provided, with the standard set of spare parts recommended by the manufacturer of the equipment. The recommended list of spare parts shall be submitted to the Engineer prior to the delivery of the equipment.

All spare parts shall be plainly tagged and marked for identification and ordering. They shall be treated with suitable preservatives, wrapped and packaged to provide adequate protection during storage.

The Contractor shall furnish and deliver to the Engineer, prior to the installation of any piece of equipment, three complete neatly bound sets of instruction books or trade literature for such equipment to enable the operator to understand the mechanism and its maintenance. Automatic control diagrams and complete numbered parts lists shall be supplied with the instruction books. The books shall contain clear and concise instruction for operation, adjustment, lubrication (including a lubrication chart) and maintenance of the equipment.

The Contractor shall furnish three sets of parts drawings of all equipment, including minor parts and sub-assemblies, in such detail as will permit disassembly and assembly of the equipment.

The list of all parts for the equipment, shall have the part or catalog number, name of actual manufacturer as well as supplier and other data necessary for ordering replacement parts. Part or catalog number shall be listed according to both supplier and actual manufacturer.

Such instructions and parts lists have been prepared for the specific equipment furnished and shall not refer to other sizes and types or models of similar equipment.

ART. 33 - NOTICES TO CONTRACTOR

The residence or place of business given in the bid or proposal upon which this Contract is founded, is hereby designated as the place where all notices, letters and other communications shall be served, mailed to, or delivered. Any notice, letter or other communication addressed to the Contractor and delivered at the above named place or deposited in a prepaid wrapper in any post office box regularly maintained by the United States Post Office Department shall be deemed sufficient service thereof upon the Contractor, and the date of mailing shall be the date of service. The place name may be changed at any time by an instrument in writing, executed and acknowledged by the Contractor and delivered to the Engineer. Nothing herein contained shall be deemed to preclude or render inoperative the service of any notice, letter or other communication upon the Contractor personally.

ART. 34 - RESPONSIBILITY OF CONTRACTOR

The Contractor shall take all responsibility of the work, shall bear all losses resulting to him on account of the amount or character of work, or from any unforeseen obstructions, encumbrances, or difficulties which may be encountered, or from the breaking of or leakage from any pipe, water mains or sewers, or because the nature of the land in or on which the work is done is different from what is assumed, or on account of the weather, floods or other causes, or from delayed deliveries of equipment required for any related or adjoining contract, or from damage or injury from any cause to property or persons used or employed on or in connection with the work; and he shall assume the defense of and indemnify and save harmless the Owner and its officers, and agents, from all claims of any kind arising from the performance of this Contract, except claims for injuries to or death of employees of the Owner, which injury or death is not due to negligence of, or breach of contract by, the Contractor or of any subcontractor performing any portion of the work included in this Contract.

ART. 35 - SUPERINTENDENCE BY CONTRACTOR

The Contractor shall employ at the site of the work during the performance of any part thereof, a competent foreman or superintendent who shall be satisfactory to the Engineer and who shall have full authority to act for the Contractor, and all directions given such foreman or superintendent shall be as binding as if given to the Contractor.

ART. 36 - COMPETENT MEN TO BE EMPLOYED

The Contractor shall employ only competent, skillful men to do the work, and whenever the Engineer shall notify the Contractor, in writing, that any man on the work is, in his opinion, incompetent, unfaithful, disorderly, or otherwise unsatisfactory, the Contractor shall take such measures as are deemed necessary by the Engineer.

ART. 37 - CONCURRENT CONTRACTS AND OTHER CONTRACTORS

The right is reserved by the Owner to do work using other contractors and to permit public utility companies and others to do work during the progress and within the limits of or adjacent to the Project, and the Contractor shall conduct his work and cooperate with such other parties so as to cause as little interference as possible with such other work, as the Engineer may direct.

It is agreed that the Contractor shall not be entitled to any damages or extra compensation from the Owner on account of any work performed by other contractors, that in any way affects the work under this Contract. The Engineer shall decide all questions between the Contractor hereunder, and the other contractors, and the order of carrying on the work shall always be subject to his direction and approval.

When the territory of one contract is the necessary or convenient means of access for the transportation of men, materials, equipment or appliances for the execution of work by others, the privilege of access thereon or trespass thereon or any other reasonable privilege may be granted by the Engineer. Employees of the Contractor shall not enter upon adjoining property to underpin or protect adjoining structures or for any other purpose whatsoever except with the written permission of the owners or lessees as provided by law.

If, in the judgment of the Engineer, the joint occupation of the site of the work by the Owner or by two or more contractors working on different contracts at the same time, actually impedes progress in the work herein described, then upon the recommendation of the Engineer, the Owner may extend the time for the completion of the work in the amount which accords with and compensates for the delays so caused.

In case the Contractor, by his own acts or the acts of any person or persons in his employ, shall unnecessarily delay, in the opinion of the Engineer, the work of the Owner or other contractors, by not properly cooperating with them or by not affording them sufficient opportunity or facility to perform work as may be specified, the Contractor shall, in that case, pay all cost and expenses incurred by such parties due to any such delays and he hereby authorizes the Owner to deduct the amount of such cost and

expenses from any moneys due or to become due the Contractor under this Contract. The Engineer, subject to the approval of the Owner, shall decide the extent of such delay or delays, and the amount of such costs and expenses, and his decisions shall be binding upon all parties concerned. Nothing contained in this paragraph shall, however, relieve said Contractor from any liability or damage resulting to the Owner on account of such delay or delays.

Where the work of the Contractor adjoins other adjacent concurrent contracts, the Contractor doing the latest work is responsible for making all final connections to the work of other adjacent concurrent contracts, as directed by the Engineer.

ART. 38 - MUTUAL RESPONSIBILITY OF CONTRACTORS

Should the Contractor cause damage to any other contractor on the work, Contractor agrees, upon due notice, to settle with such Contractor by agreement or arbitration, if he will so settle. If such other contractor sues the Owner on account of any damage alleged to have been so sustained, the Owner shall notify the Contractor, who shall defend such proceedings and, if any judgment against the Owner arises there from, the Contractor shall pay or satisfy it and pay all costs incurred by the Owner.

ART. 39 - SUBCONTRACTS

The Contractor shall, within thirty days after signing of the Contract, notify the Engineer in writing of the names of subcontractors he proposes for principal parts of the work.

The Contractor shall not enter into contract with any subcontractor until he receives the Owner's or Engineer's approval as to the firm's competence, experience, financial capability and municipal tax clearance. Subcontractors will be required to carry insurance equal to that of the prime contractor, or must be a named insured on all of the Contractor's policies.

The Engineer shall, on request, furnish to any subcontractor, wherever practicable, evidence of the amounts certified for payment on his account.

Each payment requisition submitted by a subcontractor to Contractor shall include a statement showing the status of all pending construction change orders, other pending change directives and approved changes to the original subcontract. Such statement shall identify the pending construction change orders and other pending change directives, and shall include the date such change orders and directives were initiated, the costs associated with their performance and a description of any work completed. As used herein, "pending construction change order" or "other pending change directive" means an authorized directive for extra work that has been issued to a subcontractor.

The Contractor agrees that he is as fully responsible to the Owner for the acts and omissions of his subcontractors and of persons either directly or indirectly employed by them as he is for acts and omissions of persons directly employed by him. He further agrees that he will bind his subcontractors to each and every part of the Contract Documents.

The Contractor shall comply with Connecticut General Statutes: Sec. 49-41a as to payment to subcontractors and material men, which provides as follows:

"The general contractor, within thirty (30) days after payment to the Contractor, shall pay any amounts due any subcontractor, whether for labor performed or materials furnished, when the labor or materials have been included in a requisition submitted by the Contractor and paid by the Owner.

The general contractor shall include in each of its subcontracts a provision requiring each subcontractor to pay any amounts due any of its subcontractors, whether for labor performed or materials furnished, within thirty (30) days after such subcontractor received a payment from the general contractor which encompasses labor or materials furnished by such subcontractor."

Nothing contained in the Contract Documents shall create any contractual relation between any subcontractor and the Owner.

ART. 40 - RELATIONSHIP OF CONTRACTOR AND SUBCONTRACTORS

The Contractor agrees to bind every subcontractor and every subcontractor agrees to be bound by the terms of the Contract, the General Conditions, the drawings and specifications, and other Contract Documents as far as applicable to his work, including the following provisions of this article, unless specifically noted to the contrary in a subcontract approved in writing as adequate by the Engineer.

The Contractor and the subcontractor agree that:

- (1) Nothing in this article shall create any obligation on the part of the Owner to pay to or to see to the payment of any sums to any subcontractor.
- (2) All Contractors and subcontractors shall cooperate with each other and must conform to the directions of the Engineer, in order that all parts of the work may progress harmoniously and expeditiously.
- (3) Each subcontractor must aid the others in as far as his services may be reasonably required. All Contractors will be required to make themselves familiar with the requirements of the drawings and specifications for the entire work.
- (4) The Contractor on one branch of the work shall allow the subcontractor for other branches of the work free access to the project and grounds in order that they may execute their work properly and promptly.

All subcontractors shall read the entire General Conditions and specifications and shall be held responsible for all items called for in them whether specifically mentioned under their particular headings or not.

IT IS UNDERSTOOD THAT THE ENGINEER WILL SUPPLY ALL INFORMATION TO CONTRACTORS ONLY AND NOT TO SUBCONTRACTORS. THE CONTRACTOR SHALL NOT ACCEPT THE STATEMENT OF ANY SUBCONTRACTOR THAT THE ENGINEER HAS APPROVED ANY SUBCONTRACTORS, HIS WORK OR ANY OF HIS DRAWINGS, AS THE ENGINEER WILL MAKE ALL SUCH APPROVALS TO THE CONTRACTOR IN WRITING.

ART. 41 - ASSIGNMENTS

The Contractor or his thoroughly qualified and designated representatives shall give his personal attention constantly to the faithful prosecution of the work.

He shall not sell, transfer, assign or otherwise dispose of this Contract or any part thereof to any third party. The Contractor shall perform with his own organization and with the assistance of workmen under his immediate superintendence work amounting to not less than forty percent (40%) of the total price bid for the Project. Subject to the above provision and to the consent of the Owner, work may be sublet. It is understood, however, that any consent of the Owner for the subletting of any of the work under the Contract in no way relieves the Contractor of his full obligations under the Contract. The consent to sublet any part of the work and the acceptance by the Owner of the surety bond shall not be construed

to be an approval of the said subcontract or of any of its terms, but shall operate only as an approval of the making of a subcontract between the Contractor and subcontractor. The subcontractor shall look only to the Contractor for the payment of any claims of any nature whatsoever arising out of the said Contract, and said subcontractor agrees, as a condition of the granting by the Owner of the consent to the making of said subcontract, that neither the subcontractor, his agents or employees shall make any claim whatsoever against the Owner for any work performed or thing done by reason of said subcontract. The Owner will not consent to the making of any subcontract unless the proposed subcontractor furnishes a statement to the effect that said subcontractor is acquainted with all the provisions of the Contract Documents and agrees thereto.

The Contractor shall not assign, by power of attorney or otherwise, any of the moneys to become due and payable under this Contract, unless by and with the written consent of the Owner, and such consent of approval, if given, will in no way relieve the Contractor from any of the obligations of said Contract.

Assignment of this Contract or any part thereof or of any funds to be received thereunder by the Contractor shall contain a clause to the effect that it is agreed that the funds to be paid the assignee under the assignment are subject to a prior lien for services rendered or materials supplied for the performance of the work called for in said Contract in favor of all persons, firms, or corporations rendering such services or supplying such materials.

If the Contractor shall, without previous written consent, assign, transfer, convey, sublet, or otherwise dispose of the Contract in whole or in part of his right, title or interest therein, or any of the monies to become due under the Contract from any person, firm, or corporation, the Contract may at the option of the Owner, be revoked and annulled and the Owner thereupon is relieved and discharged from any and all liability and obligations growing out of same to the Contractor and to his assignee or transferee; and no right under this Contract or to any money to become due hereunder, shall be asserted against the Owner in law or in equity by reason of any so-called assignment of this Contract or any part thereof, or any monies to grow due hereunder unless authorized as aforesaid by the written consent of the Owner.

ART. 42 - SAVE OWNER HARMLESS

The Contractor shall, from time to time, as required by the Owner, furnish satisfactory evidence that all persons who have done work or furnished materials under this Contract, or have suffered damage on account of the Contractor's operations, have been fully paid or secured.

The Contractor shall indemnify and save harmless the Owner, its Engineer, officers, agents and servants and each and everyone of them against and from all suits, and costs of every kind and description, including court costs and attorney's fees, and from all damages to which the Owner or any of its officers agents or servants may be subjected by reason of injury to the person or property of others resulting from the performance of the Project, or through the negligence of the Contractor, or through any improper or defective machinery, implements or appliances used by the Contractor in the project, or through any act of omission on the part of the Contractor or his agents, employees or servants, whether or not caused by or contributed to by the Owner, Engineer, their agents, employees, or others; and he shall further indemnify and save harmless the Owner; its officers, agents, and servants from all suits and actions of any kind or character whatsoever which may be brought or instituted by any subcontractor, material-man or laborer who has performed work or finished materials in or about the Project or by, or on account of, any claims or amount recovered from infringement of patent, trade-mark or copyright. The cost thereof shall be included in the prices bid for the various parts of the work. So much money due to the Contractor under and by virtue of the Contract as shall be considered necessary by the Owner may be retained by the Owner and held until such bids, actions, claims or amounts shall have been settled and suitable evidence to that effect furnished to the Owner. It is understood and agreed, however, that the Owner hereby assumes no

obligations toward such claimants, nor in any way undertakes to pay such claims out of any funds due or that may become due the Contractor, or out of its own funds.

ART. 43 - LIABILITY OF CONTRACTOR IS ABSOLUTE

The liability of the Contractor hereunder for all injuries to persons or damages to property is absolute and is not dependent upon any question of negligence on his part or on the part of his agents, servants, or employees, and neither the approval of the Engineer of the methods of doing work nor the failure of the Engineer to call attention to improper or inadequate methods or to require a change in methods, nor the neglect of the Engineer to direct the Contractor to take any particular precautions or to refrain from doing any particular thing shall excuse the Contractor in case of any injury to persons or damages to property.

ART 44 - PERMITS

The Contractor shall obtain the following permits, approvals and certifications: CT Department of Transportation Road Work.

Although the permits or approvals cited above have been acquired by the Owner, the Contractor shall comply with the conditions and provisions of each that relate to the construction. Where special bonds, escrows and/or other forms of payments and guarantees are required, the Contractor shall provide these items at no additional cost to the Owner.

The Contractor shall obtain and pay for all other permits required for the prosecution of the work under the Contract. He shall pay all charges and expenses and shall furnish all bonds and insurance stipulated in the permits, and shall indemnify and save harmless the Owner from all claims for damages and any actions that may arise thereunder. Before the final acceptance of the work, and as a prerequisite to the release of the semi-final payment, the Contractor shall secure a written release from the authorities having jurisdiction over the lands occupied by him certifying to the satisfactory restoration of all pavements and other surfaces and the utility structures removed or safeguarded for the work.

ART. 45 - LAWS AND ORDINANCES

The Contractor will be required to comply with all federal, state, and municipal laws, ordinances and regulations in any manner affecting those persons engaged or employed in the work, or the materials used in the work, or in any way affecting the conduct of the work, either with respect to hours or labor or otherwise, and of all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same. If any discrepancy or inconsistency is discovered in the drawings, specifications, or Contract for this work in relation to any such law, ordinance, regulation, order, or decree, he shall forthwith report the same to the Engineer in writing. He shall at all times himself observe and comply with, all such laws, ordinances, regulations, orders and decrees, and shall protect and indemnify the Owner and his agents against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by himself or his employees.

The Contractor shall comply in particular to the following:

- Rules and Regulations of the Town of Brookfield, W.P.C.A.

The Contractor hereby agrees to comply with all said legal requirements and agrees that upon his failure to comply with the provisions thereof, this contract may be voidable at the option of the Owner.

ART. 46 - STATE LABOR STANDARDS/ WAGE RATES

The Contractor shall comply with all requirements of the labor laws of this State applicable to contracts for construction, alteration or repair of any public work.

Where the project is for new public works construction greater than \$1,000,000 or repair or rehabilitation work greater than \$100,000, the Contractor must abide by State Wage Rates as published by the Department of Labor in accordance with Connecticut General Statute Sec. 31-53(g).

In the event that any of the provisions contained herein or any other labor standards subsequently made applicable by passage of State Law during the life of this Contract differ from standards in effect now or modified during the life of this Contract, then the more rigorous standards shall take precedence and prevail.

The wages paid on an hourly basis to any mechanic, laborer or workman employed upon the Work herein contracted to be done and the amount of payment or contribution paid or payable on behalf of each such employee to any employee welfare fund, as defined in Section 31-53 (h) of the Connecticut General Statutes, shall be at a rate equal to the rate customary or prevailing for the same work in the same trade or occupation in the town where the work is being performed. Any Contractor who is not obligated by agreement to make payment or contribution on behalf of such employees to any such employee welfare fund shall pay to each employee as part of his wages, the amount of payment or contribution for his classification on each pay day.

The Contractor and all his subcontractors shall keep accurate records showing the name, craft or trade, and actual hourly rate of work under the Contract and shall preserve said records for two years from date of payment. The records shall be open at all reasonable hours to the inspection of the Owner and the Commissioner of Labor or their duly authorized representatives. One copy of weekly payroll records shall be filed with the Owner as required by law.

In the event it is found that any workman employed by the Contractor or his subcontractors has been paid less than the prevailing wage listed therein for the class of work performed, the Owner may terminate the Contractor's or Subcontractors right to proceed within the work, or such part of the work as to which there has been a failure to pay required wages and to prosecute the work to completion or otherwise. The Contractor and his surety shall be liable to the Owner for any excess costs occasioned thereby.

Before final payment is made by the Owner of any sum or sums due on account of work performed under the Contract, the Contractor and his subcontractors shall file written statements with the Owner certifying to the amounts then due and owing to any and all workmen for wages earned. The statements shall set forth the names of the persons whose wages are unpaid and the amount due each. The statements shall be verified by the oaths of the Contractor or subcontractor, as the case may be.

The Contract will not be awarded to any contractor who has failed to pay prevailing wages, and no subcontractor will be approved who has failed to pay prevailing wages.

ART. 47 -NONDISCRIMINATION PROVISIONS

The Contractor and all subcontractors shall not discriminate in employment practices. The Contractor must comply with all applicable State and Federal laws and regulations dealing with non-discriminatory practices.

The Contractor shall take affirmative action to insure that applicants for employment are employed, and that employees are treated during employment, except in the case of a bona fide occupational qualification or need, without regard to their race, color, religious creed, age, sex, sexual orientation, marital status, national origin, mental retardation, learning disability, or physical disability. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

The Contractor shall post in conspicuous places and make available to employees and applicants for employment, notices to be provided by the State setting forth the provisions of this non-discrimination clause. The Contractor shall state that all qualified applicants will receive consideration for employment without regard to their race, color, religious creed, age, sex, sexual orientation, marital status, national origin, mental retardation, learning disability or physical disability.

ART. 48 - SOCIAL SECURITY ACT

The Contractor shall be and remain an independent contractor with respect to all services performed hereunder and agrees to and does hereby accept full and exclusive liability for the payment of any and all contributions or taxes for social security, unemployment insurance, or old age retirement benefits, pensions or annuities now or hereafter imposed under any state or federal law which are measured by the wages, salaries, or other remuneration paid to persons employed by the Contractor on work performed under the terms of this Contract, and further agrees to obey all lawful rules and regulations and to meet all lawful requirements which are now or hereafter may be issued or promulgated under said respective laws by any duly authorized state or federal officials; and said Contractor also agrees to indemnify and save harmless the Owner from any such contributions or taxes or liability therefor.

ART. 49 - SAFETY PROVISIONS

It is understood that the Contractor will be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. He will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to all employees on the work and other persons who may be affected thereby.

The Contractor will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property, or to protect them from damage, injury or loss. He will erect and maintain, as required by the conditions and the progress of the work, all necessary safeguards for safety and protection and in addition he will comply with all applicable recommendations of the Manual of Accident Prevention in Construction of the Associated General Contractors of America, Inc.

If at any time, in the opinion of the Engineer, the work is not properly safe in respect to public travel, persons on or about the work, or public or private property, the Engineer shall have the right to order such safeguards to be erected and such precautions to be taken as he deems advisable and the Contractor shall comply with such orders. If, under such circumstances, the Contractor does not or cannot immediately put the same into proper and approved condition or if the Contractor or his representative is not upon the site so that he can be immediately notified of the insufficiency of safety precautions, then the Engineer may cause the work to be put into such a condition that it shall be, in his opinion, in all respects safe, and the Contractor shall pay all expenses of such labor and materials as may have been used for this purpose by him or by the Engineer. Such actions of the Engineer, or his failure to take such action, shall in no way relieve the Contractor of the entire responsibility for any cost, loss or damage by any party sustained on account of the insufficiency of the safety precautions taken by him or by the Engineer acting under authority of this section.

The Contractor shall comply with the Department of Labor Safety and Health regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54), or subsequent amendments to such regulations.

This project is subject to all of the Safety and Health Regulations (See 29 CFR 1518) as promulgated by the U.S. Department of Labor on April 17, 1971. Contractors are urged to make themselves familiar with the requirements of these regulations.

The Contractor shall comply with the Owner's Confined Space Entry Program, and no personnel will be permitted to participate in any work or interact with the Contractor if the Contractor does not have the appropriate equipment in compliance with said program.

The Contractor is responsible for establishing and maintaining a health and safety program throughout the course of the project so as to meet all Local, State, Federal and OSHA requirements.

The Contractor shall keep in his office, ready for immediate use, all articles necessary for giving first aid to the injured. He shall also have standing arrangements for the immediate removal and hospital treatment of any employees or persons who may be injured on or about the work.

ART. 50- LAND FOR CONTRACTOR'S USE

Land and easements for the purpose of this Contract will be provided by the Owner. If the Contractor desires the temporary use, during construction, of land or lands to which the Owner has no rights, he shall secure written permission from the owners and shall file a duplicate copy of such permission with the Engineer and Owner. Land shall not be used or occupied by the Contractor prior to the securing of permission. The Contractor shall at all times save harmless the Owner, from actions by third parties by reason of any acts or omissions by the Contractor.

Delays in easement acquisition shall act only to extend the contract period, as reviewed in other sections of the contract documents. No guarantees are given herein that all needed lands will be available at the time of contract award. Should it be required as a part of this Contract to perform work within the limits of private property, or in rights-of-way, such work shall be done in conformity with all permits and agreements between the Owner and the owners of such property, and whether or not such a condition be part of the agreement, care shall be taken to avoid injury to the premises entered, which premises shall be left in a neat and orderly condition by the removal of rubbish and the grading of surplus materials and the restoration of said private property to the same general conditions as at the time of entry for work to be performed under this Contract.

ART. 51- USE OF PREMISES

The Contractor shall confine his materials and their storage and the operation of his workmen to limits indicated by law, ordinances, permits, or directions of the Engineer, and shall not unreasonably encumber the premises with such materials, but shall store them in orderly fashion, so that they will not interfere with the work under this or other contracts. The Contractor shall not load or permit any part of the work to be loaded with a weight that will endanger its safety or unduly affect the structure or any part thereof. The Contractor shall enforce the instructions of the Engineer regarding signs advertisements, fires, and smoking.

ART. 52- PROTECTION OF PREMISES

The Contractor shall properly protect the Owner's and adjoining property from injury or damage. Any damage to same must be made good without delay. The Contractor shall make good, at his own expense, any such injury or damage done and shall leave all in as good condition as found when operations were started.

ART. 53- SANITARY FACILITIES

The Contractor shall provide and maintain in a strictly sanitary manner toilet facilities for his workmen, which shall be screened from public view. The location and the method of waste disposal shall be approved. The Contractor shall observe and enforce all sanitary regulations and maintain satisfactory sanitary conditions around and on all parts of the work.

ART. 54- TEMPORARY WATER

The Contractor shall provide and maintain temporary potable water service connections and fixtures as specified for his own use and the use of other contractors doing work at the site. The cost of temporary water meters, if required, and service charges for all water will be paid by the Contractor.

When work is completed, the Contractor shall remove all temporary water connections and fixtures as required.

The Contractor shall furnish at his own expense all water required during the performance of work under the Contract, including testing, paying for the expense and charges of same, and installing and paying for a meter if it is required.

ART. 55- TEMPORARY LIGHT, POWER, AND TELEPHONE

The Contractor shall be responsible for the furnishing of temporary light and power.

The Contractor, at his own expense, shall arrange with the local telephone company for all telephone service required by him in the performance of the work.

ART. 56- TEMPORARY HEATING

Each Contractor, at his own expense, shall provide, install, and maintain approved heating devices as required for supplying temporary heat of sufficient volume to protect the work under his Contract and to assure suitable working conditions for his workmen. Such devices shall be installed and operated in such manner that no hazards will result and that no damage will be done to any part of his work or the work of other Contractors.

ART. 57- CARE AND PROTECTION OF WORK AND MATERIALS

From the commencement of the work until its completion, the Contractor shall be solely responsible for damages caused to the property of the Owner, for the care and protection of the work covered by the Contract, and for the materials and equipment delivered at the site or incorporated in the work.

All excavated materials, construction equipment, and materials and equipment to be incorporated in the work, shall be so placed as not to injure the work and so that free access may be had at any time to all parts of the work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly and conveniently stored so as to inconvenience as little as possible public travel and adjoining tenants.

All loss, injury, or damage to the work or materials, from whatever cause, shall be made good at the expense of the Contractor.

The Contractor shall provide suitable and adequate storage room for materials and equipment during the progress of the work, including approved weathertight storage for all materials and equipment which might deteriorate if left uncovered. He shall provide protection against damage or deterioration for all equipment during storage, and after installation, until the equipment is put to use by the Owner.

During adverse weather, the Contractor shall take all necessary precautions so that the work may be properly done and be satisfactory in all respects. When required, protection shall be provided by use of tarpaulins, wood building shelters, or other approved means.

During cold weather, materials shall be preheated, if required, and the materials and adjacent structure into which they are to be incorporated shall be made and kept sufficiently warm so that a proper bond will take place and proper curing, aging and drying will result. Protected spaces shall be artificially heated by approved means which will result in a moist or a dry atmosphere according to the particular requirements of the work being protected.

The Engineer may suspend construction operations at any time, when in his judgment, the conditions are unsuitable or the proper precautions are not being taken.

The Contractor shall at all times have, as directed or approved, a sufficient number of watchmen to protect the property of the Owner, to exclude unauthorized persons from the work and to protect traffic on the public highways.

ART. 58- OWNERSHIP OF MATERIALS

Nothing in the Contract shall be considered as vesting in the Contractor any right of property in materials used, after they shall have been attached or affixed to the work or the soil, nor in materials which have been accepted for partial payment at the site of the work, as provided hereinafter, but all such materials shall upon being so attached or affixed, or so accepted, become the property of the Owner.

ART. 59- CHATTEL MORTGAGES

No materials or supplies for the work shall be purchased by the Contractor or by any subcontractor subject to any chattel mortgage or under a conditional sale or other agreement by which an interest is retained by the seller. The Contractor warrants that he has clear title to all materials and supplies used by him in the work.

ART. 60- LINES AND GRADES

All work shall be constructed according to the lines and grades shown and approved. At the site, the Engineer will lay out and mark upon the ground a base line and bench mark, from which the Contractor shall be responsible for staking out the construction lines. For sewers, the Engineer will lay out and mark suitable number of control points and bench marks. The Contractor shall employ the services of a land surveyor, licensed to practice in this state, for laying out the work, including setting of key or principal stakes, markers and levels, and preparation of cut sheets, if required, on a form approved by the Engineer.

The Contractor shall furnish all stakes, markers, and other materials, and shall furnish any assistance that the Engineer may require in laying out the base lines and establishing the bench marks, and in checking and measuring the work. Whenever the Engineer finds it necessary to carry on his operations on Sundays, legal holidays, or other times when the work of the Contractor is not in progress, the Contractor shall furnish all necessary service and assistance. He shall not proceed until he has received from the Engineer such points and instructions as may be necessary for the progress of the work. Any work improperly done without lines or levels or instructions shall be removed and replaced by the Contractor at his own expense.

No direct payment will be made for the cost to the Contractor of any of the work or delay occasioned by giving lines and grades, or making other necessary measurements, or by inspection, compensation therefor being considered as having been included in the bid or stipulated prices.

ART. 61- PRE-CONSTRUCTION AND CONSTRUCTION PHOTOGRAPHS

The Contractor shall furnish a series of photographs, taken by a commercial photographer, to show the site of the work before construction. Photographs shall be taken at such locations as may be determined by the Engineer, or at a spacing of approximately 50 feet apart in streets and 100 feet in easements and wetland areas. Two glossy prints of each picture shall be submitted to the Engineer before construction.

The Contractor shall also furnish a series of construction photographs, to show the progress of the work. At least 6 photographs shall be taken monthly at such locations as may be determined by the Engineer. Two glossy prints of each picture taken during the month shall be submitted to the Engineer at the time of the monthly estimate for progress payment. Email of photos will also be accepted.

Prints for submission shall not be less than 8 in. by 10 in. in size, and inserted in a clear plastic sleeve for binding, properly identified by text and dates on the reverse side. Negatives of all photographs, including identifications shall be furnished to the Engineer.

ART. 62- RECORD DRAWINGS

Concurrent with progress of installation, the Contractor shall maintain a set of as-built record drawings, consisting of a reproducible marked set of Engineer's drawings with additional sketches as required, denoting and dimensioning accurately all changes in elevation, location and size, of all items deviating from Engineer's drawings. The set shall be kept in the Contractor's field office and be made available for inspection by the Engineer upon request.

Upon completion of work, the Contractor shall deliver to the Engineer one up-to-date set of these as-built record drawings, prepared by a Connecticut State licensed land surveyor.

ART. 63- TIME OF THE ESSENCE

Inasmuch as the provisions of this Contract relating to the time for performance and completion of the work are for the purpose of enabling the Owner to proceed with the construction of a public improvement in accordance with a predetermined program, and inasmuch as failure to complete the work within the period specified may result in a loss to the Owner, such provisions are of the essence of this Contract.

ART. 64- NIGHT, SUNDAY AND HOLIDAY WORK

Unless otherwise especially permitted by the Engineer, no work shall be done between the hours of 4:30PM and 9:00AM, nor on Sunday or Legal Holidays, except as necessary for the proper care and protection of the work already performed. The Engineer and Owner shall be informed a reasonable time in advance of the beginning of performance of such work. Only such work will be permitted at night as can be done satisfactorily and in a first class manner and without disturbance to adjoining property owners. Good lighting and all other facilities for carrying out and inspecting the work shall be provided and maintained at all points where such work is being done. Work performed after regular working hours, on Sundays, or Legal Holidays, shall cause no additional expense to the Owner.

ART. 65- WORK IN FREEZING WEATHER

Unless written permission is given, work liable to be affected by frost shall be suspended during freezing weather. When work proceeds in such weather, the Contractor shall provide sufficient and approved facilities for creating workable conditions and protecting the work after its completion, as approved by the Engineer.

ART. 66- UNNECESSARY NOISE

The Contractor shall use every effort and means possible to minimize or eliminate noise caused by his operations, which the Engineer may consider objectionable. The Contractor shall provide working machinery, equipped with silencers or mufflers where required, designed to operate with the least possible noise.

ART. 67- WORK IN STREETS AND HIGHWAYS

The Contractor shall obtain from the proper authorities, permission to open any State, County or Municipal highway. The Contractor shall file with the Engineer, and with the agencies having jurisdiction, triplicate copies of sketches and descriptions showing the exact location and size of the opening or excavation, the time during which it is proposed to make such opening or excavation, and the proposed method of maintaining traffic during construction. The Contractor shall not make any such opening or excavation until written permission has been granted by the agencies having jurisdiction and the Engineer.

If such agencies require inspection, traffic control, signaling or other work to be done by its own forces, the Contractor shall arrange for and pay for the same.

The Contractor shall not close or obstruct any portion of a street, road, or private way without obtaining permits therefor from the proper agencies. If any street or private way shall be rendered unsafe by the Contractor's operations, he shall make such repairs or provide such temporary ways or guards as shall be acceptable to the Engineer.

After the completion of backfilling in public highways, the Contractor shall remove all surplus material, regrade, and leave in good order and dust-free condition all roadways disturbed by his operations.

He shall maintain the surface of the street over the trenches in good condition, promptly filling in all depressions caused by settlement of the backfill.

ART. 68- MAINTAINING AND SAFEGUARDING TRAFFIC

The Contractor as directed, shall build and maintain such temporary roads, passageways, trestles, and bridges as shall be deemed necessary for the accommodation of traffic on streets and roadways interfered with by the Contractor's operations, for convenient access to the various parts of the work, for access to adjacent buildings and properties, and for other necessary purposes incidental to the work. He shall erect such temporary guards, fences, warning signs, lights, and signals as may be necessary or required to protect all traffic on the streets and roadways. He shall not obstruct vehicular traffic unless he has permission from the agencies having jurisdiction to bar temporarily all traffic from the site of the work. He shall not deprive any building or property of safe and proper access except with the consent of the occupant and after due notice to the Engineer. Free access must be given to every fire alarm box, fire hydrant, valve box, or valve chamber. The temporary roads and the Contractor's access roads shall be located where directed or approved and shall be maintained in good condition. Calcium chloride or other approved means, shall be used to maintain the roads in a dust-free condition. The Contractor shall indemnify and save harmless the Owner from any expense whatsoever due to his operations in streets and highways.

ART. 69 - HAULING MATERIALS

Before starting any work, the Contractor shall arrange with the municipal, County, or State officials having jurisdiction for the use of routes of travel for hauling materials that will result in minimum inconvenience to the traveling public. Routes of travel so scheduled shall be adhered to throughout the course of the work.

The Contractor shall, at his own expense, handle, haul and distribute all materials and all surplus materials on the different portions of the work as required. Delays in handling involving storage charges and demurrage charges by the railroad and other companies shall be at the expense of the Contractor.

ART. 70- OBSTRUCTIONS ENCOUNTERED

In addition to showing structures to be built under this Contract, the drawings show certain information regarding the pipe lines and other structures which exist at the site of the work, both at and below the surface of the ground. The Owner expressly disclaims any responsibility for the accuracy or completeness of the information given on the drawings with regard to existing structures and pipe lines, and the Contractor will not be entitled to any extra compensation on account of inaccuracy or incompleteness of such information, said structures and pipe lines being shown only for the convenience of the Contractor, who must verify the information to his own satisfaction. The giving of this information upon the Contract Drawings will not relieve the Contractor of his obligation to support and protect all pipe lines and other structures which may be encountered during the construction of the work, and to make good all damages done to such pipe lines and structures, as provided in these specifications.

ART. 71- EXISTING UTILITIES

The Contractor will be required, at his own expense to do everything necessary to protect, support and sustain all sewers, water or gas pipes, railroad tracks, or telegraph poles, conduits and other fixtures laid across or along the site of the work. The Engineer, as well as the company or corporation owning said pipes, poles, or conduits must be notified of same by the Contractor before any such fixtures are removed or molested. In case any of the said sewer, gas or water pipes, service pipes, electric lights, power, telephone or telegraph poles, conduits or other fixtures are damaged, they shall be repaired by the authorities having control of the same, and the expense of said repairs shall be deducted from the moneys which are due or become due said Contractor under this Contract.

Should it become necessary to change the position, or temporarily remove any electric conduits, water pipes, gas pipes, or other pipes, or wire, in order to permit the Contractor to use a particular method of construction or in order to clear the structure being built, the Contractor shall notify the Engineer of the location and circumstances, and shall cease work if necessary, until satisfactory arrangements have been made by the owners of the said pipes or wires to properly care for the same. No claims for damages will be allowed on account of any delay occasioned thereby. The entire cost of the changes or temporary removal must be included in the unit or lump sum prices stipulated for the various items of work to be done under this Contract.

ART. 72- CONTINUITY OF UTILITY SERVICES

In all cases where temporary pipes must be installed or where sewage, water, or drainage must be pumped or otherwise carried over or around excavations or any other portions of the work, the Contractor shall furnish such pipes, pumps, and all other materials, equipment, and labor as are required to maintain continuity of service in the utilities affected.

ART. 73- PROTECTING EXISTING STRUCTURES

The Contractor shall, at his own expense, shore up and protect any buildings or structures which may be encountered or endangered in the prosecution of the work, and he shall repair and make good any damages caused to any such property by reason of his operations.

ART. 74- PROTECTING EXISTING TREES AND SHRUBBERY

The Contractor shall protect trees, shrubs, and grassed areas on the lands of the Owner, and on adjacent lands, from being cut, trimmed, or injured, unless specifically ordered otherwise, for clearing the site of the work. Any damage to trees, shrubs, or grassed areas shall be made good by the Contractor, at his own expense, to the satisfaction of the owners thereof.

Tree roots shall not be mutilated nor shall they be cut except by permission of the Engineer. When the Contractor is permitted to cut tree roots, he shall cut the ends off smoothly, without splitting or shattering them. The trunks of the trees shall be carefully protected from damage, and if unavoidable damage occurs, the injured portions shall be neatly trimmed and covered with an application of grafting wax. Excavating machinery, cranes, etc., shall be handled with care to prevent damage to shade trees, particularly to overhanging branches, and branches shall not be cut off except by special permission of the Engineer. No special compensation will be made for the protecting of existing trees and shrubbery, but such cost shall be considered as having been included in the lump sum prices or unit prices as stipulated for the work to be done under the Contract.

ART. 75- MONUMENTS AND LANDMARKS

When any bench mark or monument, whether of stone, concrete, pipe, or a mark on the pavement, designating the lines of the streets or highways or of private property, is in the line of any trench or other construction work and may have to be removed, the Contractor shall notify the Engineer in writing at least 24 hours in advance. Under no circumstance shall such monument be removed or disturbed by the

Contractor or by any of his men without a written order from the Engineer. The Contractor shall furnish the necessary labor which may be required in resetting any monument, under the direct supervision of the Engineer. Should any monument be destroyed through accident or neglect, the Contractor shall be required, at his own expense to employ a licensed surveyor acceptable to the Engineer, to re-establish the monument.

ART. 76- SEWAGE, SURFACE AND FLOOD FLOWS

The Contractor shall furnish all the necessary equipment, shall take all necessary precautions, and shall assume the entire cost of handling any sewage, seepage, storm, surface and flood flows which may be encountered at any time during construction of the work. The manner of providing for these flows shall meet with the approval of the Engineer, and the entire cost of said work shall be considered as included in the prices bid for work to be done under this Contract.

ART. 77- SUSPENSION OF WORK

If the Engineer deems it advisable, or upon a determination by the Owner that all or any portion of the Work should be suspended, delayed or interrupted, then the Engineer may order the Contractor in writing to stop work on all or any part of the Contract, and the Contractor shall do no work when so ordered until he has received written notice from the Engineer to resume work. When work is suspended as above provided, payments for the completed parts of suspended work will be made as provided hereinafter and a suitable extension of time for completing the work will be granted. No payment will be made for work done by the Contractor when done in violation of said order by the Engineer.

ART. 78- ABANDONMENT OF WORK

Should the Contractor abandon or in any manner fail to complete the work under this Contract, the Owner is hereby authorized and empowered to pay any laborers or mechanics for work done who may have been employed by said Contractor upon the work herein, and to pay any claims against the Contractor for materials furnished, out of any funds that would otherwise be due or become due said Contractor under this Contract, and in every such case the Owner is hereby authorized and empowered to ascertain through the Engineer, the amount or amounts due or owing to such labor or laborers, or for materials, from said Contractor, in such manner and upon such proof as said Owner may deem sufficient. And the amount or amounts so found by the Engineer to be due and payable to such labor or laborers, or for materials furnished, shall be final and conclusive against the Contractor, and may thereafter be paid by the Owner to said labor or laborers, or to liquidate claims for material furnished; and any payment may be withheld from said Contractor until all such claims for labor or material on the Contract have been satisfied.

ART. 79- DEFAULT OF CONTRACTOR

The Owner may terminate this Contract upon the occurrence of any one of the following events of Contractor default:

- (1) If the Contractor shall fail, within the time required, to begin the work to be done under this Contract, or
- (2) If the work to be done under this Contract shall be abandoned, or
- (3) If the Contractor shall be adjudged bankrupt or make an assignment for the benefit of creditors, or
- (4) If a receiver or liquidator shall be appointed for the Contractor or for any of his property and shall not be dismissed within 20 days after such appointment, or the proceedings in connection therewith shall not be dismissed within 20 days after such appointment, or the proceeding in connection therewith shall not be stayed on appeal within the said 20 days, or,

- (5) If the Contractor shall fail to or refuse to regard laws and ordinances, and such orders as may from time to time be given by the Owner or the Engineer with respect to the work, or
- (6) If the Contractor shall refuse or fail, after notice from the Engineer, to supply enough properly skilled workmen or proper materials, or
- (7) If the Contractor shall violate any of the provisions or covenants of this Contract or shall not perform the same in good faith in accordance with the terms hereof, or
- (8) If the Contractor shall refuse or fail to prosecute the work or any part thereof with such diligence as will insure its completion within the period specified (or any duly authorized extension thereof) or shall fail to complete the work within said period, or
- (9) If the Contractor shall fail to make prompt payment to persons supplying labor, material or equipment for the work, or
- (10) If the Contractor shall assign or sublet the work otherwise than as specified, or
- (11) If the Engineer should be of the opinion and shall certify in writing to the Owner that the work or any part thereof is unnecessarily or unreasonably delayed, or that the Contractor is not complying with his orders, or is not executing the Contract in good faith, or that suitable and sufficient workmen, material, plant, power tools, supplies, or other means of carrying on the work are not provided to carry out all requirements of the Contract.
- (12) If the Contractor disregards laws, ordinances, rules, regulations, or orders of any public jurisdiction.
- (13) If the Contractor disregards the authority of the Engineer.

ART. 80- UNFINISHED WORK COMPLETED BY THE OWNER

Upon a declaration of default of the Contractor and termination as hereinbefore provided, the Owner shall, by written notice, order the Contractor not to begin, or not to resume, or to discontinue all work under this Contract or any part of such work, and thereupon the Contractor shall not begin, or shall not resume, or shall discontinue all work or such part thereof, and the Owner shall thereupon have the power, in the manner prescribed by law, to contract for the completion of the work or such part thereof, or to place such and so many persons as they may deem advisable by contract, or call on Surety to complete the work or otherwise to work at and to complete the work or part thereof, or so much of the work or part thereof, as the Owner may direct or may place under contract, and take possession of and use any or all plant, tools, appliances, equipment, supplies, property, and materials as they may find upon the site of the work, and procure or cause to be procured, by contract or otherwise, all plant, tools, appliances, equipment, supplies, property, and materials for the completion of the same, and charge the whole expense of the completion of the work, or part thereof, to the Contractor or his Surety.

The expense so charged, together with the administrative, legal, engineering, and other costs associated with terminating the Contract and re-contracting the Work, and also liquidated damages for delay in the completion of the work, if any, as provided, shall be deducted and paid by the Owner out of such moneys as may be then due or may at any time thereafter become due under and by virtue of this Contract or any part thereof. In case such expense and liquidated damages, if any, shall exceed the sum which would have been payable under this Contract, if the same had been completed by the Contractor, he shall and will pay the amount of such excess to the Owner; and in case such expense and liquidated damages, if any, shall be less than the sum which would be payable to the Contractor, if the Contractor

had completed the Contract, he shall be entitled to the difference, subject to all the other terms, covenants and conditions of this Contract.

ART. 81- CERTIFICATE OF COST OF WORK COMPLETED BY OWNER

In the event of the Owner's undertaking, by contract or otherwise, to perform the work or any part thereof as hereinbefore described, the certificate of the Engineer, as to the amount of work done, the cost and amount of excess cost, if any, of performing or completing the work called for by this Contract, and as to the amount of liquidated damages hereunder, shall be binding and conclusive upon the Contractor, his Sureties, successors, assigns, lienors and to all claimants of any part of the moneys payable hereunder.

ART. 82- CONTINUATION OF WORK BY CONTRACTOR

When any particular part of this work is being carried on by the Owner, by contract or otherwise, under the provisions of this Contract, the Contractor agrees to continue the remainder of the work in conformity with the terms of this Contract and in such manner as not to hinder or interfere with the persons or workmen employed by the Owner.

ART. 83- THE OWNER'S RIGHT TO DO WORK AND THREE DAY CLAUSE

If the Contractor or his subcontractors should neglect to prosecute the work properly or fail to perform any provisions of the Contract, the Owner, after three (3) days written notice to the Contractor, may without prejudice to any other remedy he may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor; provided, however, that the Engineer shall approve both such action and the amount charged to the Contractor.

ART. 84- CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE

If, through no act or fault of the Contractor, the Work is suspended for a period of more than ninety days by the Owner or under an order of court or other public authority, or the Engineer fails to act on any Application for Payment within thirty days after it is submitted, or the Owner fails for 45 days to pay the Contractor any sum finally determined to be due, then the Contractor may, upon seven days' written notice to the Owner and the Engineer, and provided the Owner does not remedy such suspension or failure within that time, terminate the Contract and recover from the Owner payment as provided herein. In lieu of terminating the Contract and without prejudice to any other right or remedy, if the Engineer has failed to act on an Application for Payment within thirty days after it is submitted, or the Owner has failed for 45 days to pay the Contractor any sum finally determined to be due, the Contractor may upon seven days' written notice to the Owner and the Engineer stop the Work until payment of all such amounts due the Contractor, including interest thereon.

In the event the Contractor properly terminates the Contract pursuant to this article, then in such case, the Contractor shall be paid (without duplication of any items):

1. For 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. For 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;
3. For amounts paid in settlement of terminated contracts with Subcontractors, manufacturers, fabricators, suppliers or distributors and others (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and court and arbitration or other dispute resolution costs incurred in connection with termination of contracts with Subcontractors and manufacturers, fabricators, suppliers or distributors); and

4. For reasonable expenses directly attributable to termination.

The Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss or any consequential damages arising out of such termination.

ART. 85- ESTIMATE OF QUANTITIES

Wherever the estimated quantities of work to be done and materials to be furnished under this Contract are shown in any of the Contract Documents including the Proposal, they are given for use in comparing bids and the right is especially reserved, except as herein otherwise provided, to increase them or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the work contemplated under this Contract, and such increase or diminution shall in no way vitiate this Contract, nor shall any such increase or diminution give cause to the Contractor for claims or liability for damages. Unit prices included in the contract documents shall be used for both increases and reasonable decreases in quantities that might occur.

ART. 86- EXTRA WORK AND CHANGES IN THE WORK

Without invalidating the Contract, the Owner may order deletions or deductions in the contract Work or may order extra work or changes involving alterations or additions to the work, the Contract price being adjusted accordingly. Such ordered deletions or increases in the work shall be executed under the conditions of the Contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change.

No extra work or changes in the work covered by the Contract Documents shall be done or made by the Contractor without the written approval by the Owner or the Engineer, acting officially for the Owner, and unless subject to an established unit price, not until the price for doing or making such change is agreed upon in writing.

Changes or credits for the work so ordered and approved shall be determined by one or more, or a combination of three methods, as approved by the Owner as follows:

- (a) By such applicable unit prices, if any, as are set forth in the Contract; or
- (b) If no such unit prices are set forth, then by unit prices or by a lump sum mutually agreed upon by the Owner and the Contractor; or
- (c) If no such unit prices are set forth and if the parties cannot agree upon prices or a lump sum, then, for work performed the Contractor shall receive as compensation the actual cost to him, which cost shall include:
 1. Labor, including foreman;
 2. Materials entering permanently into the work;
 3. The ownership or rental cost of construction plant and equipment during the time of use on the extra or changed work;
 4. Power and consumable supplies for the operation of power equipment during the above time;
 5. Insurance;
 6. Social Security and old age and unemployment contributions;
 7. Plus a fixed fee to be agreed upon but not to exceed 15 percent of the summation of Items 1 through 6 above, which fee shall be compensation to cover the cost of supervision, overhead, bond, profit, and any other general expenses.

If all or part of the extra work is done by a subcontractor, subcontractor's overhead in the amount of 5 percent may be added to cost of labor and materials, if methods (b) or (c) above are used.

The Contractor shall give the Engineer access to all accounts, bills, payrolls, and vouchers relating to such extra work and he agrees that he shall have no claim for compensation for such work unless a statement in writing of the actual cost of the same, fully itemized as to labor, materials, and other allowable costs is presented to the Engineer before the fifteenth day of the month following that during which each specific order was complied with by him.

It is understood and agreed by the Contractor that the Owner reserves the right to have such extra work done by any persons, person, or corporation other than the Contractor, unless an agreement upon the prices to be paid for such extra work can be promptly reached between the Owner and the Contractor. Should said extra work be done by any person, persons, or corporation other than the Contractor, all of the provisions as hereinbefore provided shall apply and the Contractor agrees to make no claim for damages or for any privileges or rights, other than that provided in the Contract, by reason of such work by others, except for an extension of time to perform this Contract as may be certified to the Owner by the Engineer, and approved by the Owner.

Should the Contractor consider himself entitled to extra compensation on account of the before mentioned alterations or changes, he shall notify the Owner by making his claim in writing to the Engineer before proceeding with the work in question. Should the Contractor proceed with the said work in compliance with the written order of the Engineer, it is to be construed as his acceptance of the order and the stipulated compensation for the said work.

ART. 87- CLAIMS FOR EXTRA WORK

If the Contractor claims that any instructions issued by drawings or otherwise involve extra cost under this Contract, he shall give the Engineer written notice thereof within 48 hours after the receipt of such instruction, and in any event before proceeding to execute the work; except in emergency endangering life or property, the procedure shall then be as provided for in the preceding section. No such claim shall be valid unless so made.

ART 88 -SUPPLEMENTARY CONTRACT

Where conditions require an unforeseen and major change in, and addition to the work after the Contract has been signed, the Contractor will undertake to enter into a Supplementary Contract at agreed prices, to cover the cost of said changed work, and shall, if requested, waive any right to do such work as extra work.

ART. 89-CONTRACTOR'S CLAIM FOR DAMAGES

If the Contractor shall claim compensation for any damage sustained by reason of the acts of the Owner or its agents, he shall, within seven days after sustaining of such damage, make a written claim and statement to the Engineer of the nature of damage sustained. On or before the fifteenth day of the month sustained, the Contractor shall file with the Engineer an itemized statement of the details and the amount of such damage alleged to have been sustained and unless such statement is made as thus required, his claim for compensation will not be considered by the Owner.

In addition to the foregoing statements, the Contractor shall, upon notice from the Owner, produce for examination by the representatives of the Owner, all his books of accounts, bills, invoices, payrolls, subcontracts, time books, daily reports, bank deposit books, bank statements, check books, and canceled checks, showing all of his acts and transactions in connection with or relating to or arising by reason of this Contract, and submit himself and persons in his employ for examination under oath by any person designated by the Owner to investigate claims made against the Owner. Unless the aforesaid statements shall be made and filed within the time aforesaid and the aforesaid records submitted for examination, and

the Contractor and his employees submit themselves for examination as aforesaid, the Owner shall be released from all claims arising under, relating to or by reason of this Contract, except for the sums certified by the Owner to be due under the provisions of this Contract.

ART. 90- RESOLUTION OF DISPUTES

This Contract shall be interpreted in accordance with the laws of the State of Connecticut.

All unresolved claims, disputes and other matters in question between OWNER and CONTRACTOR arising out of, or relating to the Contract Documents, or the breach thereof, shall be resolved as follows: a) the parties may agree to submit any such claim, dispute or matter in question to mediation before a mediator acceptable to the parties; b) if the parties do not agree to submit such dispute to mediation, or if such mediation fails to result in resolution of such claim, dispute or matter in question, then by a State court of the jurisdiction in which the Project is located.

ART. 91- EXTENSION OF TIME FOR COMPLETING THE WORK

If the Contractor be delayed in completion of the work under the Contract by any act or neglect of the Owner or of any other Contractor employed by the Owner, or by changes in the work, or by any priority or allocation order duly issued by the Federal government, or by any unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God or of public enemy, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes and severe weather, or by delays of subcontractors or suppliers occasioned by and of the causes described above, or by delay authorized by the Engineer for any cause which the Engineer shall deem justifiable, then:

For each day of delay in the completion of the work so caused, the Contractor shall be allowed one day additional to the time limitation specified in the Contract, it being understood and agreed that the allowance of same shall be solely at the discretion and approval of the Engineer.

No such extension of time shall be made for any delay unless the Contractor, within 5 days after the beginning of the delay, shall have informed the Owner or Engineer in writing of the nature of the delay, its cause, and its estimated duration. The Engineer will ascertain the facts regarding the delay and notify the Contractor within a reasonable time of its decision in the matter.

The Contractor shall use all honorable and reasonable means to prevent strikes, to avoid violations of labor agreements or other actions calculated to create dissatisfaction with working conditions. Should strikes occur, he shall make all proper and reasonable efforts to effect early settlement and resumption of the work. Should collusion by the Contractor be proven in the case of strikes or lockouts, then no extension of time for completion of the Contract will be given. Burden of proof in this case shall rest entirely with the Contractor.

No claim for damages or any claim other than for extensions of time as herein provided shall be made or asserted against the Owner by reason of any delays caused by the reasons hereinabove mentioned.

ART. 92- LIQUIDATED DAMAGES

It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the date of beginning and the time for completion as specified in the Contract of the work to be done thereunder are essential conditions of this Contract; and it is further mutually understood and agreed that the work embraced in this Contract shall be commenced on or before a date to be specified in the Owner's written notice to commence the work.

The Contractor agrees that said work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly

understood and agreed, by and between the Contractor and the Owner, that the time for the completion of all work described in the Contract Documents is a reasonable time for the completion of same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

If the said Contractor shall neglect, fail, or refuse to complete the work within the time specified in the Contract, or within such further time as may be properly granted by the Owner in accordance with the provisions of this Contract, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner the amount specified in the contract, not as a penalty but as liquidated damages for such breach of Contract as hereinafter set forth, for each and every calendar day that the Contractor shall exceed the time stipulated in the Proposal for completing the work.

The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the true value of the damages which the Owner and third parties who are eligible to receive sewer service, will sustain by failure of the Contractor to complete the work on time, such as loss of revenue from service charges, additional costs of interest charges, delays caused to other work by failure to perform this Contract, and other damages, some of which are indefinite and not susceptible of easy proof, and said amount is agreed to be the amount of damage which the Owner will sustain and said amount shall be recovered by the Owner by deducting the same out of any monies due or that may become due the Contractor, and if said monies are insufficient to cover said damages, then the Contractor or his Surety shall pay the amount of the difference.

As specified under "Inspection", the costs of engineering and inspection performed during overtime hours, or after the specified date of completion (regardless of the granting of extensions of time), shall be deducted from funds owed to the Contractor, as damages sustained by the Owner caused solely by actions of the Contractor.

It is further agreed that time is of the essence of each and every portion of this Contract and of the specifications, wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract an extension of time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this Contract.

It is also understood and agreed that the Contractor will not be charged with liquidated damages when the Owner determines that the Contractor is without fault and that the Contractor's reasons for requesting a time extension are acceptable to the Owner. If an extension of time is approved, said liquidated damages will be charged the Contractor from the end of such extension to the completion of the work. However, whether or not an extension of time is granted by the Owner, the Contractor shall pay to the Owner all costs of engineering field work and inspection from the completion date, as determined from the number of days specified for completing the work, to the date of actual completion.

ART. 93- PREPARATION OF ESTIMATES FOR MONTHLY PAYMENTS

Preliminary drafts of estimates for partial or monthly payment for work done and materials delivered shall be delivered to the office of the Engineer no later than the fifth day of the month following the period covered by such estimate.

Each preliminary or final draft payment requisition submitted by the Contractor to Owner shall include a statement showing the status of all pending construction change orders, other pending change directives and approved changes to the original contract. Such statement shall identify the pending construction change orders and other pending change directives, and shall include the date such change orders and directives were initiated, the costs associated with their performance and a description of any work completed. As used herein, "pending construction change order" or "other pending change directive" means an authorized directive for extra work that has been issued to the Contractor.

After the preliminary drafts have been approved, final drafts of such estimates shall be prepared by the Contractor, and delivered to the office of the Engineer no later than the tenth day of the month following the period covered by such estimate. Classes of work listed on a partial estimate shall be only those approved, and in the quantities so approved. Equipment, materials and work shall conform to the approved breakdown statement, and shall be considered only the extent, approved by the Engineer, as indicated on daily work report sheets, as of the date on which the work was done.

On each estimate where pipe and conduits in paved streets are included for payment and the proposal does not contain a separate line item for pavement restoration, the Contractor shall deduct \$15.00 per square yard of permanent pavement area until such time as the permanent pavement is placed and approved. In unpaved areas, the deduction shall be \$10.00 per foot of trench until permanent restoration is completed and releases are obtained from the affected property owners. Deductions for incomplete testing shall be in accordance with the article entitled 'Materials Included in Monthly Estimates. All such deductions shall be made from the Value of Work Completed, before calculation of retention's.

No estimate or payment shall be required to be made when, in the judgment of the Engineer, the total value of the work done since the last estimate amount to less than One Thousand Dollars (\$1000.00).

Deviation from the above procedure by the Contractor will result in disapproval of the estimate. The work and materials included on such disapproved estimate shall not be submitted for consideration until the next monthly estimate is submitted.

ART. 94- DAILY WORK REPORTS AND DELIVERY SLIPS

Daily work reports shall be prepared by the Contractor on forms acceptable to the Engineer, and shall be submitted to the Engineer on or before noon of the day following the day's work reported, properly prepared and signed.

The Contractor shall furnish the Engineer with copies of delivery slips covering all material delivered to the site of the work, which is to be included in any monthly estimate. All materials delivered to the site of the work, whether from a supplier's warehouse or from the Contractor's stock, shall be covered by such delivery slips. Delivery slips shall be submitted daily with the daily work report sheets.

Deviation from the above procedure by the Contractor, as to daily work reports and delivery slips, will result in disapproval of items of work. Such disapproved items shall not be included in any monthly estimate until properly reported on daily work reports and/or on approved delivery slips.

ART. 95- MATERIALS INCLUDED IN MONTHLY ESTIMATES

Allowances for payment to the extent listed herein, for equipment and materials specifically listed on the approved breakdown statement of the lump sum bid, may be included in the next monthly estimate after the stages herein have been reached:

- | | | |
|-----|--|--|
| (a) | Upon completion of delivery | 75% of the equipment or material price shown in the breakdown statement. |
| (b) | Upon completion of erection or installation (including subsurface pipe installation) | Not more than 90% of the installed price shown in the breakdown statement, or in the unit price bid. |
| (c) | Upon successful completion of acceptance tests | 100% of the price shown in the breakdown statement, or in the unit prices bid. |

All such equipment and materials included for payment in the monthly estimate shall be and become the property of the Owner and, on demand, the Contractor at his own expense shall promptly execute, acknowledge, and deliver or cause to be executed, acknowledged, and delivered to the Owner for any and all such equipment and materials included in any monthly estimate, proper bills of sale or other instruments in writing in a form and as required by the Owner from the Contractor and from any person, firm, or corporation manufacturing for, or selling or shipping or delivering to the Contractor any such equipment and materials, conveying and assuring to the Owner title to such materials included in such estimate free from all liens and encumbrances; and the Contractor at his own expense shall mark such materials as the property of the Owner and shall take such other steps, if any, as the Owner may require or regard as necessary to vest title in the Owner to such equipment and materials free from all liens and encumbrances. The Contractor shall, however, notwithstanding such transfer of title to the Owner be absolutely responsible to the Owner for any loss or damage to such equipment and materials until the same shall have been completely installed and tested, all work under the Contract completed and accepted, and shall at his own cost replace any equipment and materials lost or damaged.

ART. 96- PAYMENTS

Not later than 45 days after receipt of the monthly estimate, the Owner will make partial payment to the Contractor on the basis of the estimate of the work performed during the preceding calendar month by the Contractor, and duly approved and certified by the Engineer, which estimate includes the allowances set forth hereinbefore. All such payments shall be considered tentative only, subject to correction in the final estimate, and need not be based on accurate measurement. These payments are to be made purely to aid the Contractor to meet his current bills and for no other purpose.

The Owner will retain the following amounts from each estimate, in addition to payments withheld for payment of claims, defective work, etc., as specified elsewhere:

- a) During construction a retention of 5% payments claimed will be held until completion at "semi-final" payment, after which 2.5% will be retained until completion of the maintenance period, provided that the Contractor is making satisfactory progress and there is no specific cause for greater withholding.
- b) Retentions for payment of claims, defective work, potential losses, etc., as specified elsewhere, may also be withheld.

Failure by the Contractor to pay subcontractors and material men within the time provided by Article 39 and Section 49-41a of the Connecticut General Statutes, shall constitute an event of default and grounds for disapproval by the Engineer of the current periodical estimate for partial payment.

ART. 97-OWNERS RIGHT TO WITHHOLD PAYMENTS AND MAKE APPLICATION THEREOF

The Owner may withhold from the Contractor as much as any approved payments due him as may in the opinion of the Owner be necessary:

- a) To assure the payment of just claims of any persons supplying labor or materials for the work then due and unpaid;
- b) To protect the Owner from loss due to defective work not remedied;
- c) To protect the Owner from loss due to injury to persons or damage to the work or property of other contractors, subcontractors, owners of utilities, or others caused by the act or neglect of the Contractor or any of his subcontractors; or.
- d) In the event that there has been a lapse or cancellation of the insurance required under Article 8.

The Contractor shall, at the request of the Owner, furnish satisfactory proof that all obligations of the nature hereinabove described have been paid, remedied, discharged, or waived. If the Contractor fails to do so, then the Owner may, after having served written notice, withhold from Contractor's unpaid compensation a sum of money deemed reasonably sufficient to cover any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged, whereupon payment to the Contractor shall be resumed in accordance with the terms of this Contract, but in no event shall the provisions of this article be construed to impose any obligations upon the Owner to either the Contractor or his Surety.

In paying any unpaid bills or obligations of the Contractor, the Owner shall be deemed the agent of the Contractor and any payments so made by the Owner shall be considered a payment made under this Contract by the Owner to the Contractor, and the Owner shall not be liable to the Contractor for any such payments made in good faith.

If the moneys retained under this Contract are insufficient to pay the sums found by the Owner to be due under the claims for labor and materials, the Owner may, at his discretion, pay such sums, and the Contractor or his Surety shall repay to the Owner all sums so paid out.

ART. 98- OPERATING TESTS

Prior to and as a requirement for receiving semi-final payment, the Contractor shall conduct all operating tests called for in the specifications, including but not limited to, watertightness tests of piping systems, tests of motorized and pneumatic equipment and their controls, tests of meters, gages and other instruments, tests of all control systems, pump tests and other tests as specified or directed. Testing shall be performed in the presence of the Engineer or his authorized representatives.

In the event that any tests fail to meet the requirements of the specifications, the Contractor shall make alterations, repairs or replacements as required in order that all systems equipment and appurtenances meet the operating tests as specified. The intent of the Contract is to provide a complete installation in accordance with the drawings and specifications, in working order, and ready for operation.

ART. 99- CLEANING UP

The Contractor shall expressly undertake at his own expense:

- a) Frequently to clean up all refuse, rubbish, scrap materials, and debris caused by his operations to the end that at all times the site of the work shall present a neat, orderly, workmanlike appearance;
- b) Before semi-final payment, to remove all surplus material, false work, temporary structures, including foundations thereof, plant of any description, and debris of every nature resulting from his operations and to put the site in a neat orderly condition; and
- c) Before semi-final payment, he shall restore all areas which have been used for storage of materials and equipment, and all areas which have been disturbed by his operations to their original conditions, or to a condition satisfactory to and approved by the Owner. He shall seed or sod any grassed area damaged by his operations (except for delayed seeding as provided in the Contract), and shall maintain such areas until the expiration of the maintenance period. Any such areas which fail to show a uniform stand of grass shall be reseeded or resodded until an acceptable stand of grass exists.

ART. 100- CERTIFICATE OF COMPLETION

Upon completion of all work required, or assigned during the contract period, except maintenance, as explained under "Maintenance", and final pavement, when applicable, the Engineer shall prepare a

Certificate of Completion certifying that all work has been performed and materials supplied in full accordance with the terms of the Contract and that the necessary Products and Completed Operations insurance is in place as required by Article 8. Acceptance of the Certificate of Completion by the Owner shall constitute "acceptance of the work".

After completion and acceptance of the Certificate of Completion by the Owner, the retention previously held, will be reduced as indicated in Article 96.

ART 101- FINAL ESTIMATE AND SEMI-FINAL PAYMENT

Upon completion of all work required, except maintenance, the Engineer shall file with the Owner a "Final Estimate" stating, from actual measurements or observation, the entire amount of work performed and compensation earned by the Contractor, including Extra Work and compensation therefor, under and according to the terms of the Contract. The Owner reserves the right to disregard claims for compensation submitted by the Contractor after the date of final estimate.

Within 45 days after the filing of the final estimate, and provided that the Owner is satisfied that the necessary Products and Completed Operations insurance is in place as required by Article 8, the Owner will pay to the Contractor the amount therein stated, less retainage, and less all prior payments and advances whatsoever to or for the account of the Contractor. All prior estimates and payments shall be subject to correction by this payment, which is throughout this Contract called the semi-final payment. In any event, the semi-final payment will not be released to the Contractor until all outstanding claims against the Contractor shall have been satisfied.

ART. 102- ACCEPTANCE OF SEMI-FINAL PAYMENT CONSTITUTES RELEASE

The acceptance by the Contractor of the semi-final payment shall be and shall operate as a release for all things done or furnished in connection with this work and for every act of the Owner and others relating to or arising out of this work. No payment, however, semi-final or otherwise, shall operate to release the Contractor or his Sureties from any obligations under this Contract or the Contract Bonds.

ART. 103- MAINTENANCE

During a period of one year subsequent to the date of the acceptance of the work by the Owner, or as provided below, the Contractor agrees to replace the material which does not conform to the Contract requirements, and to repair any defects in materials or the work, or to make any changes required without cost to the Owner, to the satisfaction of the Engineer, and in conformity with the Contract Documents, provided that orders for such replacements, repairs or changes are received by him in writing within the one year period. The Contractor is not obligated thereby to do any work of replacement or repair that he may prove, to the satisfaction of the Engineer, to have resulted from abuse of the work, or materials by parties other than the Contractor, after the date when the Owner puts to use that part of the work requiring replacements or repairs, or has approved the Certificate of Completion, and has accepted the work.

If the Owner shall deem it necessary and shall so order, such replacement, changes or repairs shall be undertaken within 24 hours after service of notice. If the Contractor unnecessarily delays or fails to make the ordered replacements, changes or repairs within the time specified, or if any replacements, changes or repairs are of such nature as not to permit the Contractor to undertake them within 24 hours, then the Owner shall have the right to make such replacements, changes, or repairs and the expense thereof shall be paid by the Contractor or deducted from any moneys due the Contractor, or from any moneys of the Contractor retained by the Owner.

If the Owner puts to use for which it is built or installed, any structure or equipment prior to the acceptance of all work under the Contract, the maintenance period for such structure or equipment shall be calculated from the time when such use begins.

ART. 104- SURETY DURING MAINTENANCE PERIOD

The Performance Bond and Labor and Material Payment Bond submitted with the executed contract shall remain in full force and effect for the duration of the maintenance period.

ART. 105- FINAL CERTIFICATE AND FINAL PAYMENT

Twelve months after the acceptance of the work by the Owner, the Engineer shall file with the Owner a "final certificate" certifying that all work has been performed and materials supplied in full accordance with the terms of the Contract and stating therein the amount retained. Upon approval of the final certificate by the Owner, the Owner will pay to the Contractor the amount therein stated.

Final payment, however, will not be released to the Contractor until:

- a) He presents proof that all claims against the Contractor have been satisfied;
- b) He executes and delivers a release substantially in the following form: "In consideration of the above payment we hereby release the Owner and his agents from all claims and liability of whatsoever nature for anything done or furnished or in any manner growing out of the doing of the work."
- c) He secures and files with the Owner statements from Officials that the highway surfaces, if any, under their jurisdiction have been restored satisfactorily.

ART. 106- NO WAIVER OF CONTRACT

Neither an extension of time for any reason beyond the date fixed herein for the completion of the Contract, nor the delivery and acceptance of any articles or materials, nor any payment for, nor acceptance of the whole or any part of the work by the Engineer, or any possession taken by the Owner or its employees or agents, shall be deemed to be a waiver by the Owner of the right to abrogate this Contract for abandonment or delay or non-performance in the manner therein provided, nor shall it operate to void or annul any of the terms of this Contract.

ART. 107- NO ESTOPPEL

Neither the Owner nor any of his officers, shall be precluded or estopped by any certificate made or given by the Owner, the Engineer, or other officer, agent or appointee of the Owner under any provision of this Contract, from at any time (before the completion and acceptance of the work and payment therefor, or before the end of the maintenance period) showing the true and correct amount and character of the work done and materials furnished by the Contractor or any other person under this Contract, or that any such certificate is incorrect or improperly made in any particular, or that the work and materials, or any part thereof, do not in fact conform to the specifications and drawings, and the Owner shall not be precluded or estopped, notwithstanding any such certificate and payment in accordance therewith, from demanding and recovering from the Contractor such damages as it may sustain by reason of his failure to comply with the Contract Documents.

ART. 108- OTHER PROHIBITED INTERESTS

No official of the Owner who is authorized in such capacity and on behalf the Owner to negotiate, make, accept or approve, or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this Contract, in any part hereof. No officer, employee, architect, attorney, engineer or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory, or other similar functions in connection with the construction of the Project shall become directly or indirectly interested personally in this Contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the Project.

ART. 109 - NOT USED

ART. 110- CONFORMANCE WITH MUNICIPAL AND STATE REQUIREMENTS

Prior to commencement of any work, the Contractor shall obtain all permits and approvals required to be acquired by the Contractor by the Town agencies having jurisdiction, utility companies and CONNDOT. These requirements may include, but are not limited to the following:

- Road opening permits

Contractor shall pay all fees, establish escrows and provide insurance and bonds required by these permits and approvals.

All State and local requirement shall be satisfied prior to commencement of work.

ART. 111- EXEMPTION FROM SALES AND COMPENSATING USE TAXES

In computing their bids, bidders are not to include the sales and compensating use taxes of the State or of any city and county in the State on any supplies or materials to be sold to the Owner, which is exempt from such taxes.

PERMIT REQUIREMENTS AND FORMS

ACKNOWLEDGEMENT

The Applicant acknowledges and agrees to save the Town free and harmless from any injury or claim arising out of the work to be done, and further that he/she has knowledge of the existence of this Article II, EXCAVATIONS [Adopted 8-6-79], and 192-12 through 192-21, Code of the Town of Brookfield, Connecticut, and intends to comply fully with its provisions as well as all other ordinances and laws relating to the work to be done including Director of Public Works specifications.

Applicant Signature: _____

Date: _____

ACCEPTABLE FORMS OF SECURITY WHEN POSTING
A BOND WITH THE TOWN OF BROOKFIELD

1. Check
2. Letter of Credit
3. Passbook

A Letter of Assignment signed by applicant and lending institution official, plus two (2) signed withdrawal slips must accompany each passbook.

(The Town of Brookfield does not accept Certificates of Insurance as security for bonds)

ASSIGNMENT OF SAVINGS BANK DEPOSIT

Assignment made this _____ day of _____, 20____,
by _____ of _____, Assignor, to the Town of
Brookfield, a municipality within the County of Fairfield, State of Connecticut, Assignee.

For valuable consideration, receipt of which is hereby acknowledged, the
Assignor hereby assigns to the Assignee all the Assignor's interest in the following bank
accounts:

<u>Bank Name</u>	<u>Account No.</u>	<u>Amount</u>
------------------	--------------------	---------------

The Assignor hereby delivers to the Assignee all passbooks, if any, for said
accounts listed above, which passbooks are to be retained by the Assignee for the
duration of this assignment.

The Assignor hereby directs said bank or banks to pay the Assignee, its legal
representatives, or assigns, up to the full amount of such deposit upon demand.

The undersigned appoints the Treasurer of the Town of Brookfield as its attorney
in fact for the purposes of carrying out the terms of this assignment and to take any
action or execute any instruments necessary hereto and the undersigned hereby ratifies
and confirms all that may be lawfully done by virtue hereof.

IN WITNESS WHEREOF, the Assignor has signed this instrument.

Dated this _____ day of _____, 20 ____.

Assignor

Accepted and acknowledged this _____ day of _____, 20 ____.

By _____

Bank: _____

GENERAL SPECIFICATIONS

SECTION S-1 EARTHWORK AND BACKFILL

S 1.01 LIMITS OF DISTURBANCE

The Contractor shall limit all work to the limits designated on the drawing. The limits outside the roadway shall be staked with clearly flagged stakes prior to the start of construction, where appropriate. The WPCA shall be contacted for inspection of the staked limits.

Silt fencing shall be installed as shown on the contract documents. The silt fence shall be installed to protect all areas that will be disturbed during that workday which includes areas that vehicles and equipment will travel. It is the contractor's responsibility to install and maintain the silt fence and other erosion control measures during the entire duration of construction. Required maintenance of all erosion control measures shall be the responsibility of the Contractor for the duration of the project or until all disturbed areas are adequately stabilized. Contractor shall not be entitled to any additional compensation for maintain these items.

S 1.02 EXCAVATION

Excavation shall mean the removal from place of all materials including rock, pavement, curb, topsoil, in-situ soil and organic material such as peaty or humus material.

S 1.03 UNAUTHORIZED EXCAVATION

All excavation carried beyond the lines and grades shown, specified or established by the Engineer, together with its disposal, shall be at the Contractor's expense. All such spaces shall be filled by the Contractor, at his own expense, with concrete, foundation material, or compacted suitable material as directed.

S 1.04 STORAGE AND DISPOSAL

Excavated material, which is suitable and approved for backfill and fill shall be placed in storage piles unless or until it can be placed in the work. It shall not be placed close to the sides of excavations, where the weight of the material could create a surcharge on such sides, whether sheeted or not. Places for storage as directed by the Brookfield WPCA Inspector.

Unsuitable material or material in excess of that required for fill, backfill or other purposes, including any stored surplus, shall be disposed of off the site, by the Contractor at his own expense, unless needed for municipal fill purposes.

S 1.05 SHEETING AND BRACING

Where excavations are made with sides which require supporting, sheeting and bracing shall be used, of sufficient strength to sustain the sides of the excavations and to prevent movement which could in any way injure the work, or diminish the working space sufficiently to delay the work. Sheeting shall be of a material that will not split while being driven. Special

precautions shall be taken where there is additional pressure due to the presence of other structures, and in such case, the Contractor shall submit, for the Engineer's approval, an outline plan showing the lines on which he proposes to drive sheeting and the method proposed for bracing against the loads imposed by the structure. Such plan shall be prepared by a Registered Professional Engineer of this State and said plan shall bear the signature and seal of said Engineer. Sheeting and bracing shall be removed before the completion of the work, unless otherwise specified.

The Contractor will be permitted to remove sheeting or bracing except as follows:

- a) Where the Engineer determines that removal of sheeting or bracing constitutes a potential danger to the work, adjacent utilities or structures; or may cause settlement of pavement.

Omission of any sheeting or bracing called for above will only be permitted at the Contractor's risk after approval by the Engineer, and with suitable credit.

After backfilling the trench, no sheeting shall extend to within 18 inches of the original ground surface. Compensation for temporary sheeting and bracing and for sheeting and bracing left in place, shall be deemed to be included in the bid price for Bid Item No. 14.

It is the Contractors sole responsibility to determine if sheeting and shoring is required to complete the work within the limits of disturbance indicated on the drawings. All cost associated with the design, permitting, installation and removal shall be the Contractors responsibility and included in the Contractors Bid. No additional compensation will be made to the Contractor for this work.

The Contractor shall also be responsible for working within the limits of disturbance and pay limits shown on the drawings and details. All quantities will be calculated based on the limits of disturbance and pay limits shown of the drawings. The Contractor will not be compensated for additional quantities of any item beyond those shown on the drawings. Should a limit of disturbance or payment limit not be clearly indicated on the drawings or details, the Contractor shall assume the pay limit for forcemains is 2.5' on either side of the pipe, 4' outside any manhole or pump station and 4' on either side of a gravity sewer line. These limits only apply if the limits are not clearly shown on the drawings.

S 1.06 DEWATERING

The Contractor shall provide, operate and maintain satisfactory facilities and equipment, which to contain, collect and pump all water entering excavations or other parts of the work or structure to be built therein is completed. All excavations shall be kept free of water until the work or structure to be built therein is completed. Approved sediment bags and pumps shall be provided for catching and temporarily holding water containing mud, clay, sand, or other material in suspension, pumped from excavations. Such sediment bags shall be large enough to allow reasonable storage time for the settlement of such suspended matter. The settled material shall be cleaned out frequently and disposed of as directed.

Lowering of ground water to the injury or detriment of other structures shall be a part of the Contractor's risk and responsibility. Any structure injured or damaged as a result of the lowering of ground water shall be repaired or replaced to the satisfaction of the Owners thereof, at the expense of the Contractor.

Dewatering shall be accomplished by methods which shall insure that the groundwater will be drawn down to an elevation two feet (2') below the bottom of the bedding. Upon removal of dewatering equipment, the Contractor shall backfill, compact, and pave (in road) all holes.

Dewatering for the pipelines shall commence when groundwater is first encountered and shall be continued until such time as the backfill operation has been completed. The Engineer may direct the Contractor to continue dewatering operations for additional two (2) days after backfilling has been completed. Groundwater shall not be allowed to rise around the pipe until the trench is backfilled.

Discharge of groundwater resulting from the dewatering of trench excavations shall in no case be pumped directly into any body of water or drainage system. Unless a naturally vegetated drainage course is available for said discharge, suitable silt/sand traps shall be provided to remove and set suspended materials at the point of discharge.

The dewatering pump shall be screened and soundproofed in order to avoid subjecting the adjoining residents to objectionable noise levels. If in the opinion of the Engineer the noise level from the dewatering pump is excessive, the Contractor shall immediately take additional steps to further reduce the noise level of the pump. If required, the pump shall be provided with a critical silencer and should be enclosed with a sound deadening enclosure.

Dewatering shall be conducted in accordance with the requirements on the project plans. The contractor shall provide a plan to the Brookfield WPCA Engineer for approval for all dewatering activity prior to implementing said activity.

The contractor shall provide, at minimum, one additional sediment bag and sump pump on site during all dewatering operations. There is to be no disruption in the day's work that would prohibit the excavation from being backfilled.

S 1.07 BACKFILL AND FILL

All backfill, and fill under pipes and structures, shall consist of suitable approved foundation material. All other backfill and fill, in unpaved areas unless otherwise specified or required, shall consist of a suitable selected and approved earth or sand generally from storage of approved suitable excavated material, free from rejected organic matter, boggy, peaty humus or other unsuitable material such as unconsolidated silt, rubbish, waste, ashes, or cinders and with less than 15% of size 200 sieve material. If sufficient suitable material for backfill is not available from the excavated material in unpaved areas, as determined by the Engineer, the Contractor shall procure elsewhere a sufficient quantity of suitable bank run sand and gravel and shall furnish and place such material. No frozen earth shall be used for backfill, and all stones more than 6 inches in the largest dimension shall be removed from acceptable earth for fill.

S. 1.08 PLACING AND COMPACTING BACKFILL

Backfill shall be made to the slopes, grades, and elevations shown, specified, or required. Backfills shall be compacted, as hereunder specified, to a density at least equal to that of the adjacent undisturbed soil, so as to avoid future unequal settlement.

No backfill shall be placed until the structure has been inspected in place and approved. Backfilling shall be carried out as soon as possible after such approval, and the amount of trench left open shall be kept to a maximum length of 50 feet except that not more than 25 feet shall be left open at the end of the work day. Any trenches not completely backfilled by the end of the working day, shall be covered with steel plates sufficiently strong to carry roadway traffic.

Trenches shall be backfilled with bank run sand and gravel to a depth of 12 inches over the pipe, and compacted with mechanical tampers. After a compacted coverage of 12 inches has been made, the remainder of the trench shall be completely filled in an approved manner. Puddling from compaction will not be permitted except with coarse to medium granular materials and as approved by the Engineer. Bulldozing of backfill material into trenches will be prohibited unless it is done in uniformly spread layers, not over 12 inches thick and immediately machine tamped.

The Contractor shall provide material as required to compensate for settlement of backfill and fill.

When sheeting is being withdrawn, all cavities left thereby shall be filled with suitable granular earth, hosed or tamped in place so as to fill all voids thoroughly.

Backfill or fill shall be carried to a subgrade that permits topsoil of the required depth to be placed to bring it to the finished grade. As far as practicable, the underlying backfill or fill shall be given time to settle through several heavy rains or by artificial wetting before the new topsoil is placed.

Backfilling shall be completed using the method of construction for sewer pipes and manholes in accordance with ASTM D2321. Compaction of backfill material shall be in accordance with ASTM D1557.

Backfill in the area between the bedding and the pavement subbase course shall be compacted to ninety-five percent (95%) maximum dry density as determined by the ASTM D-1557 test procedure. Backfilling shall progress to the springline of the pipe, then between the springline and the crown of the pipe, and then backfill from the crown of the pipe to a point twelve inches (12") above the top of the pipe. After that, individual lifts of initial backfill shall be no greater than twelve inches (12") in thickness.

Trench backfill material shall be best excavated dry material or suitable imported material where determined necessary by the engineer.

All unsuitable or excess excavated material is to be directly loaded on trucks and removed from

the site of work and disposed of legally at no additional cost to the OWNER.

S 1.09 SAND, STONE AND GRAVEL

Bank run sand and gravel shall consist of hard, sharp, clean granular material, free of organic matter. The material shall be free of any considerable amount of flat, laminated or elongated particles and shells, silt, clay, limestone, shale or other deleterious matter. The material must be capable of compaction to the density specified or required by the Engineer. The material shall contain no stones larger than 3 inches in their largest dimension, and no more than 15% of the material by weight shall pass a No. 200 sieve.

Gravel and crushed stone shall consist of hard, sharp, clean material. The material shall be free from fines, shells, clay, limestone, shale or other deleterious matter. Material shall be supplied as a mixture of sizes with 5% to 10% of the material passing a No. 40 sieve and the remainder ranging in size from 3/8-inch to 1-inch.

Foundation material shall be placed and firmly compacted by mechanical tamping equipment. Care shall be taken to place and compact material under pipe haunches.

Foundation material shall consist of clean gravel or crushed stone, as specified above and as approved; it shall not include bank run or excavated material.

S 1.10 TOPSOIL

Where topsoil on the areas to be excavated is of acceptable quality for use in the work, it shall be stripped therefrom to a depth directed, cleared of stumps and roots, and stored at approved locations separate from other storage until required to be placed on top of the backfill, fill or other areas, as shown, specified or directed.

In easements and all other areas where seeding or sodding is required, the Contractor shall furnish and spread a minimum of 4 inches of topsoil.

New topsoil shall consist of natural loam obtained from an area that has never been stripped, and shall be free from hard clods, stiff clay, partially disintegrated stone, cement, ashes, roots, or other undesirable material.

During the period of settlement, the Contractor shall maintain all trenches and provide for additional backfill to keep the finished grade of such trenches as near as possible to the original ground elevation. When ordered by the Engineer, but not before trench settlement has substantially ceased, the Contractor shall proceed with and complete all property restoration.

S 1.11 ROCK EXCAVATION

Rock excavation shall mean removal of boulders exceeding one cubic yard in volume, and solid ledge rock and masonry, which in the opinion of the Engineer requires for its removal, wedging, sledging, barring, or breaking up with a power operated tool. No blasting shall be performed by the Contractor. Soft or disintegrated rock which can be removed with a pick or power operated

excavator or shovel, loose, shaken, broken stone in rock fill or elsewhere, and rock exterior to the maximum limits allowed, or which may fall into the excavation, shall not be included as rock excavation. Pavements, curbs, and driveways shall not be included as rock excavation.

When rock is encountered, the Contractor shall completely expose the rock surface, within the trenching payment limits shown on the contract documents, and notify the Engineer. Rock excavation if any, shall be paid at the prices bid for this item in the proposal. The limits of rock to be exposed shall not exceed the pay limits described in the contract documents unless approved by the engineer.

The Contractor shall notify the Engineer before starting any excavation, so that elevations and the measurements of the excavation area may first be obtained. When ledge rock is encountered, the Contractor shall notify the Engineer and shall strip or expose the rock to such an extent that in the Engineer's opinion the necessary measurements can be taken. If the Contractor fails to give such notice or notices, or removes any material prior to the taking of measurements, the Engineer may presume that measurements taken at the time he first saw the material in question indicates the true quantity of excavation.

S 1.12 LIMITS OF EXCAVATION

Excavations shall be made to the approved lines which shall be of sufficient width outside the structure to give room for placing and removing forms for concrete and for forming the pipe joints. Excavations for all structures shall not be plowed, scraped, or machine-dug closer than 3 inches to the finished subgrade. The last 3 inches of depth for all structures including pipe shall be removed with pick and shovel to the exact lines and grades just before placing foundation material, or pipe supports. The pipe elevations noted refer to the center lines and inverts and due allowance shall be made for excavating to a lower depth to accommodate foundation material or pipe supports. Bell holes shall be hand excavated for any pipe with a bell dimension larger than the pipe barrel.

Excavations made adjacent to or in the proximity of existing structures shall be made with special care and in such a manner as not to damage the structures or disturb the supporting backfill and foundations of such structures.

Trench Excavation

- (1) Excavation shall be accomplished using suitable equipment for the conditions anticipated for the work. Excavation shall not progress more than fifty feet (50') ahead of pipe laying operations. Not more than twenty five feet (25') of open trench shall be left uncovered following the sewer main installation, unless specifically required.
- (2) Extreme care shall be exercised in excavating in the vicinity of existing sanitary, gas or drain pipes, and service connections. These facilities shall be properly protected or support as necessary. Where such pipes or conduits form an obstruction to the line and grade of the sewer main, any removal, alternation or rearrangement of

utilities shall be completed by the CONTRACTOR in a manner acceptable to the ENGINEER.

- (3) Trenches shall first be excavated to the top of the Pipe Embedment Zone (12 inches above the crown of the pipe). Excavation for other appurtenances shall have twelve inches (12") minimum and twenty-four inches (24") maximum clearance on all sides. The ground surface adjacent to all open trenches shall be graded to prevent surface water from entering the excavation, as required.
- (4) Excavation of the Pipe Embedment Zone shall be carefully progressed to the depth of bedding and shall not exceed the maximum trench width of the outside diameter of the pipe plus 24 inches.
- (5) Should the excavated width of the Pipe Embedment Zone exceed the maximum values listed above, the pipe shall be constructed in higher class bedding, or the class of pipe shall be increased, or both in accordance with the loading conditions at that specific location.
- (6) Where the bottom of the trench will not support the pipe in the opinion of the Engineer, the Contractor shall furnish and install additional foundation material under the bedding. The Contractor shall make such additional excavation and construct foundation of the thickness directed by the Engineer.

Final pavement disturbance areas will be measured based on the actual field measurements; however, pavement disturbances beyond the maximum width indicated above plus 0.5 foot cut back on either side of the trench will not be considered by the Authority for payment unless these limits of disturbance have been approved by the Engineer or the Authorities Representative (in writing) prior to disturbance activity. For pavement areas that have been disturbed beyond the maximum limits of 5 feet that were not approved as noted above will be paid based on the 5 foot maximum trench width plus the 0.5 foot cut back on either side of the trench for the liner feet measured in the field.

S 1.13 SEEDING

All areas to receive new topsoil shall be seeded. After the area to be seeded has been graded to the required elevation, the surface shall be raked to true lines. All objectionable material, which would interfere with a finely pulverized seed bed, shall be removed.

The surface shall be seeded at a rate of pound per acre per 1,000 square feet of fresh, clean grass seed of the latest crop, mixed in the following proportions by weight:

<u>Species</u>	<u>LBS. Per Acre</u>	<u>Per 1,000 S.F.</u>
Spreading Fescue	15	0.3
Chewings Red Fescue	15	0.3
Kentucky Bluegrass	25	0.6
Perennial Ryegrass	10	0.2

An approved fertilizer shall be applied with the grass seed at the rate of 500 lbs. per acre.

Grass seed shall be sown in the Fall from August to October, or in the Spring between March and May. Seeding shall be done in dry or moderately dry soil at times when the wind velocity does not exceed 5 mph. After seeding, the surface shall be evenly raked with a fine toothed rake, than rolled with an approved roller, and finally watered with a fine spray. During dry weather, grassed areas shall be watered daily with sprinklers until grass is firmly rooted.

The Contractor shall maintain all seeded areas without additional payment until the expiration of the maintenance period. Any areas that fail to show a uniform stand of grass will be reseeded and refertilized at the Contractor's expense, until an acceptable stand of grass is established.

S 1.14 SUBMITTALS

Certifications. Tests and Inspections required under this Section shall be certified in accordance with the Contract Documents and shall be submitted for review by Engineer.

Shop Drawings. Shop Drawings (1 copy) are required for all Earthwork related items including but not limited to the following:

- (1) Dewatering Plan (as necessary)
- (2) Sediment Bags (as necessary)
- (3) Sheeting and Bracing design by a CT Licensed Engineer, where applicable
- (4) Silt Fencing
- (5) Filter Fabric
- (6) Seed Mix

END OF SECTION S-1

SECTION S-2 CONCRETE

S 2.01 MATERIALS

Ingredients of the concrete mixtures used shall meet the following requirements:

Cement	-	ASTM Designation C150, Type II
Air Content	-	3% to 6%
Aggregates	-	ASTM Designation C33
		Max. size of coarse aggregate-3/4inch
Water	-	From approved source
Ready Mixes	-	ASTM Designation C94

28 Day Strength

	<u>3,500 psi.</u>	<u>2,500 psi.</u>
Water-Cement Ratio, Gal./bag	5 1/4	6 1/4
Slump, inches	2 to 4	2 to 4
Mm. Cement Quantity, Bags/c.y.	6 1/2	5 1/2

S 2.02 GENERAL REQUIREMENTS

Unless otherwise ordered, the following procedures shall be followed:

- A. The proposed concrete mix and source shall be submitted to the Engineer for approval 10 days before use.
- B. Unless otherwise shown or ordered, reinforced concrete shall be 3,500 psi. strength, and unreinforced concrete of 2,500 psi. strength.
- C. Concrete not discharged within 60 minutes after adding water shall be wasted.
- D. When required by the Engineer, test cylinders shall be prepared and tested in accordance with ASTM Designations C31 and C39. Contractor shall provide certified test results from a competent laboratory.
- E. Forming, if required, shall be as approved by the Engineer, and shall not be removed for 2 days after pouring.
- F. Concrete shall not be placed on mud, in water, or at temperatures below 40F. Concrete shall be placed in layers, with mechanical vibration, and without interruption unless approved construction joints are used.
- G. For at least 7 days, concrete shall be cured by being kept continuously moist and suitably covered. Surfaces shall be finished as required.

- H. No backfill shall be placed against fresh concrete for at least 7 days after pouring, unless otherwise approved.

S.2.03 NON-SHRINK GROUT

Non-shrink grout shall consist of Type I Portland Cement and sand, and shall contain an aggregate that eliminates shrinkage of the grout. Materials used shall be as hereinbefore specified. The non-shrink grout mixture shall conform to Master Builders Company Embeco Pre-Mixed Grout, or L. Sonneborn Sons, Inc. Ferrolith G Redi-Mixed Grout. The non-shrink grout mixture shall be used in accordance with the manufacturer's recommendations.

S 2.04 WATERSTOPS

Waterstops shall consist of a durable, elastic cured rubber compound, or an extruded polyvinyl chloride which shall be dimensionally stable, dense, homogeneous, and non-porous.

The waterstops shall be capable of effectively sealing construction, expansion, or special joints in concrete against the infiltration or leakage of water.

The rubber waterstops and polyvinyl chloride shall be equal to Servicized Products Corp. or Vinyley Corp. 6 inches flat dumbbell type or 9 inch center bulb type. Joints in or at intersections of waterstops shall be adequately connected by means of molded fittings and vulcanizing for rubber waterstops; heating or soldering for polyvinyl chloride waterstops, all in accordance with the recommendations of the manufacturer, so as to make the waterstops continuous and watertight.

At all joints, waterstops shall be secured in position to prevent dislocation while concrete is being placed and vibrated. The method of securing waterstops shall be submitted for approval.

S 2.05 CONCRETE ANCHORS

The Contractor shall furnish and place drill anchors and expansion anchors for fastening equipment and materials to concrete, as shown, noted, or specified. Drill anchors shall be equal to Phillips Drill Co., Red Head Flush Anchors or Bulldog Division of Gregory Industries, Inc., Gold Digger Flush Drill Anchors. Expansion anchors shall be equal to Rawl Multi-Chalk Thread in Hole, Bolt Out Style Anchor or Threaded Ring Wedge Cinch Anchor. The number of units used per expansion anchor shall be adequate to develop the full strength of the bolt.

S 2.06 LIGHTWEIGHT CONCRETE

Lightweight concrete fill shall be a porous concrete having a weight not exceeding 85 pounds per cubic foot, made by mixing an admixture equal to an Aerocrete Compound as manufactured by Aerocrete Corporation of America, or Crefeo, Inc. to a cement and sand concrete.

The Portland cement shall be as specified in Section S 2.01. Sand shall have a fineness modulus of not less than 2.2, and not more than 2.75. The Contractor shall submit the name of the supplier of materials for approval.

The lightweight concrete mix formula shall be proportioned to produce a concrete having a 28-

day compressive strength of not less than 1500 psi. The formula shall be as approved by the admixture manufacturer. Tests shall be performed on three 6 inch cubes at the end of 28 days.

Lightweight concrete fill shall be placed in lifts as approved. The setting time between lifts shall be not less than one hour, based on summer temperatures. During cold weather, the setting time shall be increased, or if approved, a catalyst equal to a Aerocrete Compound No. 2 shall be added to the mix. The setting time shall be fixed by the Engineer based on the results of the laboratory compressive tests.

The top surface of the lightweight concrete fill shall be screeded to a free and level surface and shall be formed as shown on the contract drawings.

END OF SECTION S-2

SECTION S-3 STEEL REINFORCEMENT

S 3.01 MATERIALS

Reinforcement bars for concrete reinforcement shall be deformed bars of new billet steel of intermediate grade, conforming to the requirements of ASTM Designation AIS.

S 3.02 REINFORCEMENT DETAILS

Reinforcement details shall conform to the requirements of ACI Standards 315 and 318.

S 3.03 PROTECTION

Steel for reinforcement shall be new unruled stock, free from oil, paint, dirt, or loose scale, delivered without rust, other than may have accumulated in transportation to the work. It shall be thoroughly protected from moisture at all times until placed in final position. Ends of bars that are to be left projecting for a considerable time shall be painted with a heavy coat of neat cement grout. Any steel which shows scaly rust after being placed shall be rendered wire brush clean immediately prior to the pouring of concrete.

S 3.04 PLACING REINFORCEMENT

Reinforcement shall be placed in the exact positions and with the spacing shown or ordered, and it shall be fastened in position so as to prevent its becoming displaced during the placing of concrete. Chairs and approved spacing devices shall be used to hold reinforcement in correct relationship and at the required distance from the forms. Cement briquettes shall be used for concrete poured on earth.

S 3.05 SPLICING

Maximum lengths of bars shall be used wherever possible. Where splices are necessary, bars shall be lapped 32 bar diameter to develop the full strength of the bar by bond except if noted otherwise on plans. Splices on adjacent bars shall be staggered. In slabs and beams, splices of reinforcement shall not be placed at points of maximum stress.

Adjacent sheets of welded wire fabric shall be spliced by lapping at least one foot.

Welding of reinforcement shall conform to AWS Standards or as approved.

S 3.06 CHAIR

Chairs and approved spacing devices shall be used to hold reinforcement in correct relationship and at the required distance from the forms. Cement briquettes shall be used for concrete poured on polyethylene film covered foundation material or gravel. Where chairs are used on concrete surfaces which will be exposed, the legs shall be plastic tipped.

END OF SECTION S-3

SECTION S-4 PIPES, SUPPORTS AND APPURTENANCES

S 4.01 PIPE MATERIALS

Sanitary sewer pipe material utilized in the Contract shall be Polyvinyl Chloride (PVC) or Ductile Iron (DI) as designated on the Contract Drawings. Pipe materials, fittings, appurtenances and installation shall conform to the applicable provisions of the following paragraphs of Section S-4 and the WPCA Rules and Regulations. It should be noted that the more restrictive requirement will apply.

S 4.02 DUCTILE IRON

Ductile iron pipe and fittings shall be flexible joint or flanged. In general, flexible joints shall be used for outside piping and flanged joints shall be used for inside piping except as otherwise shown. Ductile Iron Pipe and Fitting shall conform in all respects to ANSI Standard A21.51 for thickness Class 52. Flanged ductile iron pipe shall be minimum class 53. All ductile iron pipes shall be flexible joint with mechanical joints or Tyton Joints equal to United States Pipe and Foundry Co. Mechanical Joints shall conform to the requirements of ANSI Standard A21.11. Gaskets shall be full faced, furnished with plain tips. Gasket dimensions shall be in accordance with the manufacturer's standard design of dimensions and tolerances. Flanges and flange ends shall conform to the requirements of ASA Standard B 16.11.

Plain ends of pipe for coupling joints shall be prepared in strict accordance with the requirements and instructions of the manufacturer of the coupling to be used.

All ductile iron pipe and fittings shall have a double cement mortar lining and interior seal coat.

Exposed pipe and fittings furnished for interior applications shall not receive an outside protective coating, but shall be painted as specified in General Specifications. All other pipe and fittings shall be coated with an approved coat of coal tar pitch varnish.

Joints subjected to unbalanced thrust conditions shall be restrained as required, see Section S-4.08.

S 4.03 PVC GRAVITY SEWER PIPE

This specification designates general requirements for unplasticized polyvinyl chloride (PVC) Plastic Gravity Sewer Pipe with integral wall bell and spigot joints for the conveyance of domestic sewage.

Pipe and fittings shall meet extra-strength minimum of SDR-35 of the requirements of ASTM Specification D3034-74, or later revisions.

All pipe shall be suitable for use as a gravity sewer conduit. Provisions must be made for contraction and expansion at each joint with a rubber ring. The bell shall consist of an integral

wall section with a solid cross-section rubber ring factory assembled, securely "locked in" place to prevent displacement. Sizes and dimensions shall be as shown in the ASTM specification. Standard laying lengths shall be 14 feet but no greater than 20 feet.

Pipe (6-inch long section) shall be subjected to impact from a free falling tup (20-lb.) in accordance with ASTM Method of Test D2444. No shattering or splitting (denting is not a failure) shall be evident when the following energy is impacted:

Nom.						
Size, In...	4	6	8	10	12	15
Ft.-Lbs....	150	210	210	220	220	220

All fittings and accessories shall be as manufactured and furnished by the pipe supplier or approved equal and have bell and/or spigot configurations compatible with that of the pipe.

Pipe shall be designed to pass all tests at 73° F (±30°F)

Minimum "pipe stiffness" (Fly) at 5% deflection shall be 46 psi for all sizes when tested in accordance with ASTM Method of Test D2412, "External Loading Properties of Plastic Pipe by Parallel-Plate Loading".

The pipe shall be capable of carrying a trench load equal to 25 feet of cover. Under conditions of maximum cover, the pipe shall be adequate to maintain a factor of safety of two against collapse. Cross sectional deflection shall be less than 5-percent after cover material has been placed and compacted. Axial deflection shall be less than 1/4 inch per 10 lineal feet of pipe.

Two sections of pipe shall be assembled in accordance with the manufacturer's recommendation. Joint shall be tested in accordance with ASTM D3213-73T, "Joints for Drain and Sewer Plastic Pipe using Flexible Elastomeric Seals".

There shall be no evidence of splitting, cracking or breaking when the pipe is tested as follows:

Flatten specimen of pipe, six inches long between parallel plates in a suitable press until the distance between the plates is 40% (forty percent) of the outside diameter of the pipe. The rate of loading shall be uniform and such that the compression is completed within two to five minutes. Where less than 500 feet of PVC pipe is to be installed, the Owner may accept the manufacturer's certification as to conformance with ASTM specifications.

For depth of 10 feet or less to the top of the sewer main, use standard lateral connection as shown on the Drawings. For depths exceeding 10 feet, use deep house connection as shown on the Drawings.

Where laterals are to connect to new sanitary sewer main, use appropriate fitting, no saddles will be accepted.

Installation of PVC piping shall conform to the bedding details shown on the drawings.

PVC pipe shall be stored at the site with such covering as will protect the pipe from extremes of temperature which may cause swelling or shrinkage.

S 4.04 RIGID POLY VINYL CHLORIDE (PVC) FORCE MAIN

The pipe shall be PVC C-900 Class 150 (DR18) manufactured to iron pipe sizes (IPS) outside dimensions. Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe shall conform to AWWA C900 requirements. Pipe shall be furnished in maximum lengths to reduce jointing in the field. Pipe shall be joined by means of rubber ring bell joint which shall be an intergral and homogeneous part of the pipe barrel.

PVC Pipe shall conform to the following standards:

1. ASTM D1784- Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
2. ASTM D3139- Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
3. ASTM F477 – Standard Specifications for Elastomeric Seals (Gaskets) for Joining Pipe.
4. AWWA C900 – Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings.

Care should be taken during unloading and handling to prevent damage to the pipe. Never roll pipe off the truck.

Trench depth of PVC pipe should be at least 48-inches to the top of pipe or several inches below the frost line, whichever is greater. The trench bottom should be smooth and regular, free of rocks and all hard objects to allow uniform support of the pipe.

Narrow trenches may be used if the trench width is sufficient to allow for adequate tamping of the soil around the pipe, where approved.

Inspect bell, gasket and spigot to insure that they are clean and free of dirt or foreign objects.

Lubricate spigot end of pipe with factory supplied lubricant. Align the spigot with the bell and push together by hand or with a block and bar, until assembly mark on spigot is aligned with the end of the bell.

PVC pipe can be installed with gradual curves by uniformly deflecting the pipe barrel. Minimum radii of curvature are in accordance with UNIBELL recommendations.

Joints are designed to permit 2° deflection without bell distortion. Fittings should be used to effect greater deflections.

Care should be taken to provide adequate thrust blocking at all bends, intersections, ends and reductions in accordance with Engineers' recommendations.

Backfilling should be done immediately after installing each length of pipe. Backfill that will lay adjacent to the pipe should contain no large rocks or hard clods. Tamp around and under the pipe

to insure adequate soil support, as approved by the WPCA Engineer.

Pipe may be tested at any time after installation. Prior to testing make sure line is properly restrained. Do not exceed the maximum water pressure rating of the pipe.

Storage of pipe at the site shall be as specified for PVC gravity pipe.

S 4.05 COPPER TUBE

Copper tube shall conform to the requirements of ASTM Designation B88 Type.

For all other services, buried copper tube shall be type K annealed, and exposed pipe, type L hard-drawn.

Connections to the water main in the street shall be coordinated with the local water department.

S 4.06 SLEEVES, CASTINGS AND WALL FITTINGS

Ductile iron pipe passes through walls and floors the Contractor shall furnish and install duct. Iron wall castings or sleeves, as shown on the drawings.

Wall fittings for reinforced concrete pipe shall be bell wall fittings where shown on the drawings.

Where all other pipes pass through walls and floors, the Contractor shall furnish and install schedule 40 steel sleeves, except where otherwise shown.

All sleeves and castings below ground surface, or where watertightness is required, shall have a center water stop.

Sleeves shall be packed and caulked with an approved caulking compound.

S 4.07 FLEXIBLE COUPLINGS AND FLANGED COUPLING ADAPTERS

Flexible pipe couplings and flanged coupling adapters for making field joints between plain end pipes shall be of the elastic gasket type, meeting the requirements of the Code for Pressure Piping, ANSI Standard B31.1.

The couplings shall be designed and constructed to facilitate easy assembly in the field and to provide tight flexible joints when subject to expansion, contraction, irregularities and distortion due to normal settlement, and shall be as manufactured by the Dresser Manufacturing Division of Dresser Industries, Smith-Blair, Inc. or equal.

Flexible pipe couplings shall be Style 38 Dresser couplings. Flanged coupling adapters shall be style 127 for 8 inch pipe and smaller and style 128 for all others.

Unless otherwise noted, all flange coupling adapters and all flexible couplings shall be harnessed.

On ductile iron pipe the harnessing shall be done by tying adjacent flanges with tie bolts. Lock pin type harnessing may also be used.

On steel pipe, cast steel lugs shall be welded to the plain end section of pipe and the joint tied with steel bolts and nuts between the lugs and adjacent flange. Dimensions, sizes, spacing and material for tie bolts, washers and nuts shall conform to the standards of Dresser Industries, Smith-Blair, Inc. or approved equal for pipe size and test pressure indicated.

S 4.08 JOINT RESTRAINT

Pipe joints subjected to an unbalanced thrust shall be suitably harnessed to the satisfaction of the Engineer. All tees and bends deflecting 11 1/4 degrees or more and other locations where there will be an unbalanced thrust shall be harnessed in accordance with this item. The type of joint restraint the Contractor proposes to use at points of unbalanced thrust shall be submitted to the Engineer for approval.

Socket pipe clamps and tie rods may be used for joint restraint on mechanical joints. Socket pipe clamp shall be Grinnell Figures 600 with socket clamp washers, Figure 599, or approved equal for all straight pipe harnessing and for fittings of 12 inch diameter and smaller. Clamps for fittings larger than 12 inch diameter shall be specially designed and fabricated to suit the fittings proposed for use. Tie rods shall extend from the back of the bell of one joint beyond next joint to provide positive restraint. The use of socket pipe clamps as restraint devices relying on friction between the clamp and pipe barrel will not be permitted.

Dimensions, sizes, spacing, and material for lugs, tie bolts, washers, and nuts shall conform to the standards of Dresser Industries, or approved equal, for pipe size, wall thickness, and test pressure indicated.

S 4.09 TAP IN PIPES

Taps and connections to new and existing piping shall be made as required to connect new lines or equipment. The taps may be made either in the shop or in the field. Taps shall be made to the minimum thread length required under ANSI, Specification B16.1 inch ductile iron pipe cast bosses shall be provided should the thickness of the pipe fitting be less than that required.

S 4.10 JOINTS BETWEEN DIFFERENT PIPE MATERIALS

Where joints are required between pipes of different materials, the Contractor shall use an approved transition fitting or furnish details of his proposed method. The method used shall provide an adequate seal to prevent leakage at the junction.

S 4.11 EXPANSION JOINTS

Ample provisions shall be made for flexibility in all pipe lines, to compensate for expansion. Unless other forms of expansion joints are specified, all runs of pipe subject to change in length shall be fabricated shorter than their theoretical length to the extent of one-half of the expansion and shall be so erected that there may be freedom to expand without increasing the stresses imposed when cold. When the foregoing method of compensation for expansion is not adequate, the Contractor shall furnish, and install in the pipe lines, expansion devices that will be

adequate to all the lines to expand and contract freely without injury to any part of the piping system. The devices may be in the form of expansion joints, swivel or swing joints, or pipe bends, and shall include such anchors as may be shown, specified or required to make the devices effective.

Where harnessing of rubber expansion joints are shown, adjacent flanges shall be tied with tie bolts. Expansion joints shall be adequate for the maximum estimated expansion movement. Unless otherwise specified, the expansion joints on all pipe lines 2 inches (2") in diameter or smaller, shall be all brass with screwed ends; on all lines 2 1/2 inches and larger in diameter, they shall be of the iron body pattern with flanged ends and covered brass expansion element. Expansion joints shall be Flexonic, Adsco, Zellea, or approved equal.

Rubber expansion joints shall be Standard Single Arch Type, as manufactured by the Mercer Rubber Company, Metraflex Co. or approved equal.

S 4.12 COATING

Not Applicable.

S 4.13 PIPE LAYING AND INSTALLATION

All pipe and fittings shall be installed to the lines, elevations and grades shown or ordered, and in accordance with the manufacturer's recommendations.

Suitable tools and equipment shall be used for proper handling, storing, and laying of pipe and fittings. In order to avoid damage to interior coatings, lifting hooks or bars shall not be inserted therein.

Each pipe and fitting shall be checked for defects and injuries as installation proceeds. Imperfect pipe materials shall be rejected and removed from the work. Pipe found to be defective after installation shall be removed and replaced by undamaged material.

The interior of all pipe shall be cleaned of dirt, and other deleterious materials, and kept clean, as the next section of pipe is laid. During the progress of the work, the exposed ends of the pipe shall be provided with approved temporary covers fitted to the pipe, in order to prevent material from entering the pipe. All pipes shall be left clean.

Where pipe must be cut to fit as closing pieces, such cuts shall be evenly and squarely made in a workmanlike manner with approved equipment. Injury to linings or coatings shall be satisfactorily repaired. Ductile iron joints must be thoroughly brushed with a wire brush to remove all loose rust or foreign material, and soapy water brushed over the joint surfaces and over the gasket. Bolts for mechanical or flanged joints shall be tightened uniformly, using only torque-limiting wrenches to avoid overstressing the bolts. Bolt heads, nuts and all unpainted surfaces of the flanges shall be coated with two heavy applications of black asphaltum varnish.

Where pipe joints are to be welded, all welding shall be done by duly qualified welders in conformity with the Code for Pressure Piping, ANSI B31. Certificates of qualification of current

issue for the work involved executed by an approved inspection agency or corporation, shall be given to the Engineer.

I.P.S. threads for screwed joints shall be cut clean and true in conformance with ANSI Standard B2-1 for taper threads. Care shall be taken not to damage or mar pipe and fitting surfaces. Fittings shall be screwed up close to the shoulders of the male threads. No lampwick, cord, wool, or shall be used in making up screwed joints. Pipe joint compounds shall be applied to male threads only; all joints shall be made with Permatex compound.

Unless otherwise specified, handling and laying of ductile iron pipe shall comply with the methods described in Section 3 of the "Handbook of Cast Iron Pipe" of the Cast Iron Pipe Research Association. Pipe shall be laid in conformance with Laying Condition Type 4.

In general, all buried non-ferrous pipes shall be laid in accordance with the requirements of ASTM Designation on C-12.1 except where otherwise shown, specified, or approved. Joints shall be made in accordance with the recommendations of the manufacturer.

The Contractor shall excavate and dewater the trench below the pipe invert, to limits shown or ordered, and place the pipe on foundation material, as shown, specified or ordered.

Inside piping, fittings and valves shall be supported as shown, specified, or required. Where temporary supports are used, they shall be sufficiently rigid to prevent shifting or distortion of the pipe. Where expansion couplings are used, they shall be properly adjusted so that the pipe lines are liquid or gas tight during expansion or contraction.

S 4.14 MATERIAL TESTING

Ductile iron pipe shall be hydrostatically tested at the point of manufacture to 500 psi for duration of one minute. Testing may be performed prior to machining bell and spigot. Failure of ductile iron pipe shall be defined as any rupture of pipe wall. Certified test certificates shall be furnished in duplicate prior to time of shipment. All ductile iron pipe and ductile iron fittings shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured. Furnish in duplicate sworn certificates that all tests and inspections required by the Specifications under which the pipe is manufactured have been satisfied.

For plastic pipe, sand box tests shall be run on the same number of lengths as specified above. Test loads shall be equal to twice the maximum trench load.

S 4.15 GRAVITY PIPE LINE TESTING

The Authority reserves the right to retest and re-inspect any construction at any time prior to final acceptance at the end of the maintenance period. The Contractor shall be required to correct any defects found in such latter inspections even if said defects had existed, but was not reported, during a previous inspection. The Developer shall bear the cost of all pipe testing.

After installation and inspection has completed, all new sewers shall be flushed to remove all foreign material. Pipe shall be inspected and tested for alignment, freedom from obstruction,

and lack of structural damage a minimum of 90 days after installation using closed circuit television and mandrels. A mandrel rated at 5% deflection shall be passed through all new PVC sewers after 90 days has elapsed since backfilling has completed. Notwithstanding satisfactory testing, any flexible pipe deflected more than 5.0% within 90 days of installation or the date of testing, whichever is later, shall be replaced at the Contractor’s expense.

Testing of the gravity sewer lines between manholes shall be made to determine watertightness of the system. Either infiltration testing where the ground water level is sufficiently above the line or exfiltration testing shall be conducted.

Low pressure air tests shall comply with UNI-B-6-98 (or latest) “Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe”, by Uni-Bell PVS Pipe Association.

The minimum time duration permitted for a prescribed low-pressure exfiltration pressure drop between two consecutive manholes should not be less than that shown below. The prescribed drop should not exceed 0.5 psi from 3.5 to 3.0 psi in excess of the ground water pressure above the top of the pipe.

MINIMUM DURATION FOR AIR TEST PRESSURE DROP	
Pipe Size (inches)	Time (Minutes)
4	2 ½
6	4
8	5
10	6 ½
12	7 ½
15	9 ½
18	11

Despite the results of a pressure test, it is intended to achieve a watertight system and any observed leaks shall be repaired by the CONTRACTOR until corrected at no additional cost to the owner.

S 4.16 PRESSURE PIPE LINE TESTING

Pressure pipe for force mains shall be tested for leakage by the Contractor. The duration of each test shall be not less than 4 hours. The Contractor shall provide all necessary facilities, water, bulkheads, apparatus and all required labor therefore.

Force mains shall be tested under a constant hydrostatic pressure of 75 psi. Leakage in force mains shall not exceed 2-1/2 gph per inch of internal diameter per mile of pipe.

All visual leaks shall be made tight. Tests shall be repeated until the results are satisfactory.

The Contractor shall notify the Engineer five (5) days in advance of the time the test is to be made. No test shall be accepted unless witnessed by the Engineer or his authorized representative.

S 4.17 HANGERS AND SUPPORTS - GENERAL REQUIREMENTS

"Hangers and Supports" shall include all hanging and supporting devices of metallic construction shown, specified or required for pipe lines, apparatus and equipment. Included in this classification are saddle stands, steel and cast iron stanchions, hangers, pipe pole supports, supports of structural steel, and all necessary pipe saddles, pipe rolls, fastenings, anchors and appurtenances.

Hangers and supports shall be adequate to maintain the pipe lines, apparatus and equipment in proper position and alignment under all operating conditions, and have springs where necessary; they shall be adequate to prevent creeping, sagging, buckling or vibration and shall allow for expansion and contraction. Hangers and supports shall be of standard design where possible and be best suited for the service required, as approved by the Engineer, all supporting devices shall be designed in accordance with the best practice and shall not be unnecessarily heavy.

Pipe hangers and supports, where shown or required, shall be carefully located and adjusted so as to maintain the pipe in proper alignment without causing any undue strain in the pipe or in any equipment. Sufficient hangers and supports shall be installed to provide a working safety factor of not less than twelve for each hanger, assuming the pipe filled with water. Pipe shall be supported at all changes in direction and on straight runs at intervals of not more than 10 feet for pipe 1 1/2" (inch) or larger and 8 feet from pipes 1" (inch) or smaller. No pipe shall be supported from pipe of other trades. Each length of flexible joint pipe shall be supported by a minimum of two (2) supports, whether or not specifically shown.

The Contractor shall furnish, fabricate, erect or install pipe supports as detailed, including structural steel shapes and plates, grout which shall be a non-shrink grout, drill anchors, anchor bolts, Schedule 40 steel pipe which shall be threaded where required, and concrete supports.

All hangers and supports shall be screw adjustable after installation. Galvanized materials shall be finished and painted as specified in the Project Specifications.

Where temporary supports are used, they shall be sufficiently rigid to prevent shifting or distortion of the pipe.

Except when otherwise show, specified or required, hangers, supports, anchors and concrete inserts, shall be the standard types as manufactured by the Crane Co., Grinnel Co., Inc., Fee and Mason Mfg. Co., or approved equal, and shall be constructed as follows:

Pipe Rings- Malleable iron fitted with an adjusting nut of the locking type, threaded to take a rod.

Pipe Rolls - Provided with threaded nuts or with sockets to take threaded rods.
Pipe Clamps - Heavy steel, each equipped with a hooked nut to take a rod.

The Contractor's working drawings, as required by the General Provisions hereof, shall show the quality, type, design and location of all hangers and supports required under the contract.

Hangers and Supports shall conform to the requirements specified herein and to the following standards:

STRUCTURAL STEEL	-ASTM Designation	A-7
	Rivets - ASTM Designation	A-141
STEEL BARS	-ASTM Designation	A-107
STEEL CASTINGS	-ASTM Designation	A-27 (Grade 65-35, full annealed)
WROUGHT IRON	-ASTM Designation	a_189 and A-42
WROUGHT STEEL PIPE	-ASTM Designation	A-53 (Schedule 40)
IRON CASTINGS	-ASTM Designation	A-48 (Class No. 35)
CAST IRON PIPE		
STANCHIONS	-ANSI Class	125
MALLEABLE IRON		
CASTINGS	-ASTM Designation	A-47
BOLTING MATERIALS	-Bolts, stud bolts, and nuts - ASTM Designation	a-307
CHAINS	-ASTM Designation	A-56
SPRING HANGERS	-ANSI Standard	B-31.1

S 4.18 OVERHEAD HANGERS Overhead hangers shall be supported by vertical threaded rods, fastened to the various types of construction in the following manner:

Steel

- (a) By side I-Beam clamps or channel iron clamps of forged steel fastened directly to the steel beams or channels.
- (b) By welded steel brackets fastened to steel columns.

Concrete

By malleable iron concrete inserts or by expansion cases placed in the concrete.

Irrespective of the type of hanger-rod, sizes shall be determined by the size of pipe supported in accordance with the following schedule:

<u>Size of Pipe</u>	<u>Diameter of Rod</u>
3/4" to 2" inclusive	3/8 inch
2 1/2" to 3 1/2", inclusive	1/2 inch
4" to 5", inclusive	5/8 inch
6"	3/4 inch
8" to 12', inclusive	7/8 inch
14" O.D. and 16" O.D.	1 inch

The foregoing schedule is based on Schedule 80 - Wrought Iron and Wrought Steel Pipe ANSI Standard B 36.10, filled with water. Then heavier pipe is to be supported, the distance between rods shall be lessened or rods of greater diameter shall be used. For multiple pipes on trapeze type hangers, use appropriate hanger rods based on the table above and the number and sizes of pipes. Trapeze angles shall be constructed from 2 structural steel angles back to back with space in between for the hanger rods.

S 4.19 WALL AND FLOOR SUPPORTS

Supports for piping from walls, columns and floors of the various structures shall be as follows except where otherwise indicated, specified or approved:

From Walls or Columns- Welded steel brackets and adjustable stands, of the roll type or approved equal.

- (a) Pipe rolls or chairs with bases.
- (b) Saddle stands or stanchions.

Brackets shall be made of welded wrought steel and shall be designed for three maximum loads classified as follows:

Light	750 pounds
Medium	1,500 pounds
Heavy	3,000 pounds

Where medium or heavy brackets are bolted to walls, back plates of adequate size and thickness shall be furnished and installed to distribute the load against the wall. Where the use of back plates is not practicable, the brackets shall be fastened to the wall in an approved manner. Pipe rolls or chairs shall be of the cast iron type. When specified, shown or required, they shall be furnished adjustable.

Saddle stands shall be of the adjustable type. Each stand shall consist of a length of wrought steel pipe fitted at the base with a standard screw threaded cast iron flange and at the top with an adjustable saddle or roll. The base flange shall be bolted to floor or foundation.

Column supports of the cast iron pipe type or of the built-up structural steel type, of approved design, shall be installed when specified, shown or required.

Where, in the opinion of the Engineer, adjustable supporting devices are not required, pipe lines three inches in diameter and smaller may be supported on approved cast iron, malleable iron or wrought steel hooks, hook plates, ring or ring plates, offset clamps, or wall brackets with U-bolts.

Pipe supports for non-insulated copper tubes shall be copper plated.

S 4.20 ANCHORS

Anchors shall be furnished and installed when specified, shown or required for holding the pipe

lines and equipment in position or alignment. All anchors shall be designed for rigid fastening to the structures either directly or through brackets. The design of all anchors shall be subject to approval.

Anchors for piping shall be of the cast iron chair type with wrought steel straps, except where anchors form an integral part of pipe fittings or where an anchor of special design is required.

S 4.21 CONCRETE INSERTS

All concrete inserts shall be galvanized steel and shall be installed in the concrete structures where required for fastening supporting devices. They shall be designed to permit the rods to be adjusted horizontally in one plane and to automatically lock the rod nut or head. Inserts shall be recessed near the upper flange to receive reinforcing rods. To facilitate installation, nail slots shall be provided in the exposed flanges of the insert. Inserts shall be designed to safely carry the maximum load that can be imposed by the rod which they engage.

S 4.22 FLEXIBLE JOINT

The Contractor shall furnish and install as shown on the plans, flanged spool-type rubber expansion joints, equal to General Rubber Corporation Style 1075.

The body of the expansion joints is to have a single arch, to compensate for pipe motion due to thermal expansion and contraction.

The expansion joint shall be constructed with a rubber tube, suitable plies of fabric and steel wire reinforcement, a protective Ethylene-Propylene Diene Monomer cover, and to be complete with integral flanges on each end.

Rubber expansion joints are to be supplied complete with 3/8" thick split steel retaining rings having matching 125 lb. standard drilling. Proper anchoring of the metal piping on both side of the Expansion Joint is required.

S 4.23 SUBMITTALS

Certifications. Tests and Inspections required under this Section shall be certified in accordance with the Contract Documents and shall be submitted for review by ENGINEER.

Shop Drawings. Shop Drawings (6 copies) are required for the following:

- (1) Pipe and Fittings
- (2) Bedding Material Sieve Analysis
- (3) Imported Backfill Material Sieve Analysis
- (4) Pipe to Manhole Wall Connectors

Other Submittals. Other submittals required are as follows:

- (1) Pipe Testing Procedure and Instruments
- (2) Trench Dewatering Method and Equipment
- (3) Bypass Pumping Procedure

END OF SECTION S-4

SECTION S-5 EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

S 5.01 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

S 5.02 WORK INCLUDED

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete the temporary erosion control measures as shown on the drawings or as ordered by the Engineer or Owner's Field Representative. The Contractor is responsible for maintaining all required and supplemental erosion and sediment control measures and water pollution control devices for the duration of this project. The required measures shall include but not be limited to the following:
 - 1. Silt Fence
 - 2. Construction Fence
 - 3. Straw Bales
 - 4. Filter Bags
 - 5. Temporary and Permanent Seeding
 - 6. Dust Control

S 5.03 RELATED WORK

- A. S-1 Earthwork and Backfill
- B. S-4 Pipes

S 5.04 QUALITY ASSURANCE

- A. The Contractor shall perform all his operations in accordance with the rules, regulations and ordinances of those governing bodies having jurisdiction.
- B. Compliance with Other Regulations
 - 1. Unless otherwise provided, the Owner will obtain all permits and the Contractor shall comply with applicable regulations of fish, wildlife and other agencies and all applicable, Federal, State and Local statutes relating the prevention and abatement of soil erosion and water pollution. The Contractor shall request assurance of these permits prior to beginning construction operations.
 - 2. In the event of conflict between the requirements of these Project Specifications and the pollution control laws, rules or regulations of

Federal, State or Local agencies, the more restrictive laws, rules or regulations shall govern.

C. Satisfactory Performance

1. Soil erosion and water pollution control measures are of the utmost importance on this site. Soil erosion and water pollution control measures shall at all times be satisfactory to the Owner's Field Representative. When it becomes necessary, the Owner's Field Representative will inform the Contractor of unsatisfactory construction procedures and operations. If the unsatisfactory construction procedures and operations are not corrected promptly, the Owner's Field Representative may suspend the performance of any or all other construction until the unsatisfactory condition has been corrected, and such suspension shall not be the basis of any claim by the Contractor for additional compensation from the Owner nor for an extension of time to complete the Work. The Contractor is responsible for installing and maintaining adequate erosion and sediment control measures regardless of what is shown on the plans to insure there are no adverse offsite erosion and sediment control impacts.

S 5.05 SUBMITTALS

- A. Prior to the Start of the construction, the Contractor shall submit to the Engineer and Owner's Field Representative his program and schedule for accomplishment of temporary and permanent erosion control work applicable during all phases of construction, and his plan for disposal of waste materials. Where erosion is likely to be a problem, clearing and grubbing operations shall be scheduled so that grading operations and permanent erosion control features can follow immediately thereafter, if the Project conditions permit; otherwise temporary erosion control measures may be required between successive construction stages. No Work shall be started until the erosion control schedule and methods of operations have been accepted by the Engineer and Owner's Field Representative.
- B. The Contractor shall submit the following material designs for the type specified prior to materials being delivered to the site:
 1. Filter cloth
 2. Dust Control Materials, including application rates
 3. Temporary Seeding, including application rates
 4. Filter Bags

S 5.06 DELIVERY, STORAGE & HANDLING (NOT USED)

S 5.07 JOB CONDITIONS

- A. Protection of existing conditions as indicated on the contract drawings shall apply to this Section.

- B. The Contractor shall provide all necessary safeguards as may be required to prevent damage to property beyond the Work area or adjacent property.
- C. Area of Work
 - 1. The Owner's Field Representative shall have the authority to increase or decrease the surface area of erodible earth material exposed by clearing and grubbing, and/or excavation and fill operations, and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams or other watercourses, lakes, ponds or other areas of water impoundment. Other than the specific authority of the Owner as outlined above, the Contractor shall not disturb more than 5 acres at anyone time.
 - 2. The Contractor is responsible for maintaining all necessary erosion and sediment control measures for the life of the contract. The Contractor is responsible for making weekly site assessments or after each significant rainfall (significant for purposes of this section shall mean and rainfall in excess of 0.5") and make any and all necessary adjustments or repairs to the in-place measures.
 - 3. In general, the limit of the area of clearing and grubbing and/or excavation and fill operations in progress, shall be commensurate with the Contractor's capability and progress in keeping the finished grade, mulching, seeding and other such permanent control measures current and in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, as determined by the Owner's Field Representative, temporary erosion control measures shall immediately be provided by the Contractor.
- D. Temporary Erosion Control Measures
 - 1. Temporary erosion control measures shall be used to correct conditions which develop during construction that are needed prior to installation of permanent control features, or that are temporarily needed to control erosion that develops during normal construction practices, but which are not associated with permanent control features on the Project. All slopes and stockpile areas which will remain undisturbed and/or not topsoiled and seeded for a period of fifteen (15) days shall be temporarily seeded as specified on Drawings.
- E. Permanent Erosion Control Measures
 - 1. The Contractor shall incorporate all permanent erosion control features into the Project at the earliest practical time as outlined in his accepted schedule. Slopes shall be seeded as each ten (10) foot incremental height is satisfactorily completed.

S 5.08 WARRANTY (NOT USED)

PART 2 PRODUCTS

S 5.09 MATERIALS

- A. All materials shall be in accordance with the items specified on the Drawings and/or contained in the United States Department of Agriculture-Soil Conservation Service "Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas".

PART 3 EXECUTION

S 5.10 INSPECTION

- A. Examine the areas and conditions Erosion Control Measures are to be installed and notify the Engineer of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Engineer.

S 5.11 INSTALLATION

- A. General Requirements
 1. The Contractor shall conduct his operations to minimize erosion of soils and to prevent silting and muddying of streams, rivers, irrigation systems, impoundments (lakes, reservoirs, etc.) and lands adjacent to or affected by the Work, in accordance with the approved Sequence of Construction, Drawings and these Project Specifications.
 2. Construction of drainage facilities and performance of other Work which will contribute to the control of erosion and sedimentation shall be carried out in conjunction with earthwork operations or as soon thereafter as practical.
 3. Where erosion is likely to be a problem, clearing and grubbing operations shall be scheduled so that grading operations and permanent erosion control features can follow immediately thereafter, if the Project conditions permit; otherwise, temporary erosion control measures may be required between successive construction stages. The area of bare soil exposed at any one time by construction operations shall be kept to a minimum.
 4. Throughout all operations covered by this Section, the Contractor shall provide all necessary measures to control dust through the use of water, calcium chloride or other material in accordance with the approval of the Owner's Field Representative, at such locations and during such periods as he may direct, or as may be required by Local Ordinance or Authorities.

B. Waterways

1. All waterways shall be cleared as soon as practical of formwork, sheeting, debris or other obstructions placed during construction operations and which are not a part of the finished Work.
2. Ditches which are filled or partly inoperative shall be cleaned and made operative before the Contractor stops work for any day, and for the duration of the Contract shall be maintained in a condition satisfactory to the Owner's Field Representative.

C. Temporary Erosion Control Measures

1. Temporary erosion control measures shall be used to correct conditions which develop during construction that are needed prior to installation of permanent control features, or that are temporarily needed to control erosion that develops during normal construction practices, but which are not associated with permanent control features on the Project.
2. All slopes and stockpile areas which will remain undisturbed and/or not topsoiled and seeded for a period of fifteen (15) days shall be temporarily seeded as specified on Drawings.

D. Sediments and Pollutants

1. Water from operations containing sediment shall be treated by filtration, settling basins or other approved means sufficient to reduce the sediment content to no more than that of the stream into which it is discharged.
2. Pollutants such as fuels, lubricants, bitumens, raw sewage and other harmful materials shall not be discharged into or near rivers, streams, and impoundments or into natural or manmade channels leading thereto. Wash water or waste from concrete mixing operations shall not be allowed to enter live streams.

E. Permanent Erosion Control Measures

1. The Contractor may be required to incorporate permanent erosion control features into the Project at the earliest practical time as outlined in his accepted schedule. Slopes shall be seeded as each ten (10) foot incremental height is satisfactorily completed.
2. No area shall receive permanent seeding prior to approval by the Owner's Field Representative.

F. Dust Control

1. Watering equipment shall consist of pipelines, tanks, tank trucks or other approved devices capable of applying a uniform spread of water over the surface. A suitable device for regulating the flow and positive shut-off of the water shall be provided for positive control by the operator.
2. The Owner's Field Representative will advise the Contractor of any

unsatisfactory procedures for dust control. If the unsatisfactory procedures are not corrected promptly, the Owner's Field Representative may suspend the performance of any or all construction until the condition has been corrected.

END OF SECTION S-5

SECTION S-6 MANHOLES AND CHAMBERS

S 6.01 PRECAST CONCRETE MANHOLES

Unless otherwise shown, manholes and chambers shall be constructed of precast reinforced concrete riser sections, an eccentric conical or flat slab top section, and a base section as shown or required, as manufactured by International Pipe and Ceramics Corp. or Armco Steel Corp. or equal. Where required, eccentric reducing sections shall be used to join riser sections of different diameters. Manufacture shall be by wet, monolithic process.

Precast manhole sections shall be manufactured in accordance with ASTM Designation C478. The minimum compressive strength of the concrete for all sections shall be 4000 lbs. per sq. inch. The maximum allowable absorption of the concrete shall not exceed 8% of the dry weight. Tests shall be similar to those described in ASTM C76. The circumferential reinforcement in the walls of all sections shall be a minimum of 0.12 sq. in. per linear ft. for inside diameters up to and including 54 in., and 0.17 sq. in. per linear ft. for the larger sizes. Reinforcement in flat slab top sections shall be designed for the load to be supported. Additional reinforcement shall be provided at all openings larger than 6 inches.

Joints of the manhole sections shall be formed entirely of concrete in accordance with ASTM Designated C361 and shall be made with a round rubber gasket installed in accordance with the manufacturer's recommendations. Joints shall be self-centered and watertight against internal and external hydrostatic pressure with only the gasket utilized as the sealing element. Ship lap joints with rubber butyl sealant may also be utilized, as approved by the Authority or its Engineer. Each joint shall be mortared on the outside before backfilling.

Base sections shall be furnished by the manufacturer with either embedded couplings or bells, or stubbed bells and spigots, of the same type joint as the adjoining pipe. Approved alternatives will include manholes with a compressible rubber ring as manufactured by Omega, or with a flexible manhole sleeve as manufactured by Interpace.

There shall be two (2) flexible joints on each pipe and within 24" outside the manhole wall, one of which may be embedded in the manhole wall.

Waterways shall be constructed in the field after the manhole has been installed, and shall conform to the shape and size of connecting pipes as shown on the Standard Details or ordered by the Brookfield Water Pollution Control Authority's Engineer. Special care shall be taken to form channels with curved shapes that will provide the best hydraulic conditions for smooth flow. Benches shall be entirely of monolithically poured concrete and shall be sloped to drain to the waterways. Concrete used in forming waterways shall be a stiff, rich mix, as specified in Section S-2, and shall be given a steel trowel finish.

Interior and exterior surfaces of riser sections, conical sections, and the undersides of the flat slab top sections, shall be given a protective lining consisting of 2 shop coats of asphaltic paint equal to Inertol No. 49 on the exterior and 1 coat equal to AQUAFIN-IC on the interior. The total

dry film thickness shall be not less than 8 mils. The lining shall be applied in accordance with the manufacturer's recommendations. Base sections, after construction of the waterways and benches, shall be given 2 field coats of protective lining as specified hereinabove, including waterways and benches. Foundation material under manholes shall conform to the contract documents and that specified in Section S-1, Earthwork and Backfill.

Manhole frames shall be adjusted to finish grade by building a circular brick-in-mortar collar above the precast manhole opening. Maximum height of the collar shall be twelve (12) inches except where ordered. Brick shall be sound, hard, well-burned, sewer brick conforming to the requirements of ASTM Designation C-32, Grade MA and shall be laid radially. Mortar shall consist of 2 parts sand to 1 part cement, thoroughly mixed in the required proportions before adding water. After laying up the collar and setting the frame in a full bed of mortar, the exterior of the collar shall receive a minimum 3/4" (inch) thick mortar coat to provide watertightness. Manhole frames shall be set directly on the frame without brick collars.

S 6.02 MANHOLE APPURTENANCES

Appurtenances shall include manhole frames and covers, and manhole rungs.

Manhole frames and covers shall be of the best quality close grained gray iron casting, conforming to the requirements of ASTM Designation A48, Class No. 30.

Unless otherwise indicated, manhole frames and covers shall be of the circular flared type frame with round flange equal to Catalog No. 1203 as manufactured by Campbell Foundry Co. Forcemain Cleanout manholes located within the limits of the wetland areas shall have heavy duty frames and covers equal to Catalog No. 6545 as manufactured by Campbell Foundry Co.

Manhole frames and covers for shallow manholes shall be equal to Catalog No. 1011B as manufactured by Campbell Foundry Co.

All covers shall be cast with the identifying letters as approved. Letters shall be 2 inches high and embossed against a recessed background.

Manhole rungs shall be extruded aluminum alloy of the step drop front design, equal to Aluminum Co. of America or Washington Aluminum Co. Type 6061-T6. Rungs shall be cast in the vertical sides of the manhole sections on 12 inch centers. Rungs of fiberglass coated steel may be approved by the Authority's Engineer upon submission of satisfactory technical information.

Frames, covers and appurtenances manufactured by the Neenah Foundry Co., or the Lockhart Foundry Co. will be acceptable, if equal to those specified. No foreign made products shall be used.

S 6.03 LADDER UP SAFETY POST (NOT USED)

S 6.04 SUBMITTALS

Certifications. Tests and Inspections required under this Section shall be certified in accordance with the Contract Documents and shall be submitted for review by Engineer.

Shop Drawings. Shop Drawings (6 copies) are required for the following:

- (1) Precast Concrete Manhole
- (2) Manhole Frame and Cover
- (3) Bedding Material Sieve Analysis
- (4) Imported Backfill Material Sieve Analysis

Other Submittals. Other submittals required are as follows:

- (1) Pipe Testing Procedure and Instruments
- (2) Trench Dewatering Method and Equipment
- (3) Bypass Pumping Procedure

END OF SECTION S-6

SECTION S-7 VALVES

S 7.01 VALVE SCHEDULE

The following schedule denotes the various types of valves that shall be furnished and installed by Contractor for the various piping systems, unless otherwise shown, noted, or specified.

<u>Name of Pipe</u>	<u>Valves</u>
Bypass Chamber	Plug Valves & Check Valves
Force Main	Gate Valves

Valves shall be operated turning counter clockwise to open the valve and they shall be so marked with an arrow and the word "OPEN".

S 7.02 GATE VALVES

Gate valves shall be iron body, bronze mounted, double disc, parallel seat, non-rising stem, with O-ring stuffing box conforming to the requirements of AWWA Specifications C500. All valves shall be opened left (counter clockwise). All valves shall be Mueller Corporation AWWA gate valves or approved equal, with full diameter openings.

Valves 2 1/2 inches and less shall have threaded ends for screwed joints, except those for installation on copper tubing, which shall have recessed ends for soldered joints.

Valves for buried installation underground shall be furnished complete with extension stem, tee wrench, valve box and cover. All exposed valves shall be furnished with hand-wheels.

S 7.03 PLUG VALVES

Plug valves shall be iron body, bronze mounted, non-rising stem, with O-ring stuffing box conforming to the requirements of AWWA Specifications C500. All valves shall be opened left (counter clockwise). All valves shall be Mueller, Henry Pratt or equal plug valves or approved equal, with full diameter openings.

Valves up to 6 inch diameter shall be lever operated and greater than 6 inches shall be provided with hand-wheel.

S 7.04 CHECK VALVES

Valves 3" (inch) and larger shall be iron-body, bronze mounted, spring loaded and weighted lever, swing check valves designed for a working pressure of not less than 150 pounds, W.O.G. non-shock, and shall be as manufactured by Darling Valve and Manufacturing Co., A.P. Smith Manufacturing Co., Mueller Corp., or approved equal.

S 7.05 VALVE STEMS AND EXTENSION STEMS

Unless otherwise specified valve stems and extension stems shall be of bronze conforming to the requirements of ASTM Designation B147, Alloy 8A or B132, Alloy A. Stems shall be of a suitable size to provide for the operation of the valve under all conditions. Threads shall be of the square or Amce type, unless otherwise required or permitted. Approved stem guides shall be provided where required; guides shall be spaced not more than 8 feet on centers. Extension stems for buried valves shall be of sufficient length to permit setting the operating nuts 3 inches below the top of the valve box cover.

S 7.06 TESTS FOR VALVES AND GATES

All valves shall be shop tested at hydrostatic pressures equal to twice the working pressures. The manufacturer shall furnish the Engineer with certified copies of the test reports.

S 7.07 MARKING VALVES AND GATES

All valves and gates shall have the size of the opening, the name of the maker, and the working water pressure for which they are designed, cast in raised letters upon the body of yoke. All operating floor stands and bench stands for valves and gates shall have the name of the maker cast upon a prominent part.

S 7.08 VALVE TAGS AND CHARTS

Each valve shall be identified with a permanent tag bearing distinguishing numbers and letters corresponding to those on required valve charts. The tags shall be 1 1/2 inches diameter, brass, Style P- 250, as manufactured by Seton Nameplate Co., with depressed black-filled numbers 1/2 inches high and letters 1/4 inches high, as determined by the Engineer. The tags shall be securely fastened to the valves with 4 ply smooth copper wire, brass "S" hooks, or brass jack chain.

S 7.09 PAINTING

The ferrous surfaces of all valve interiors shall be given 2 shop coats of an approved asphaltum varnish or other approved coating.

The exterior ferrous surfaces of all valves shall be given a shop primer.

Valve boxes and curb boxes shall be painted inside and outside with two coats of asphaltum varnish.

END OF SECTION S-7

SECTION S-8 RESTORATION OF SURFACES

S 8.01 GENERAL

All surface disturbed by the Contractor on account of his construction and storage of materials and equipment, shall be restored in a satisfactory manner as specified herein, shown, or required. Where a specific type of restoration of surface has not been called for, the Contractor shall restore that surface to a condition at least equal to that existing prior to construction, as approved by the Engineer.

The areas which will be affected by construction and storage and within which the Contractor shall confine his operations can be generally classified as follows:

- A. Streets
- B. Unimproved Permanent Easement
- C. Storage and Staging Areas

The classifications listed above are used herein below and for the purposes of this Section are defined and described as follows:

An improved State street is one which has a paved roadway, whether of Portland-cement concrete (hereinafter referred to as "concrete"), bituminous concrete, asphalt overlay, surface treatment, or combination thereof. Disturbed surfaces to be restored, in addition to roadway pavements, shall include paved shoulders, curbs, access driveways, grassed areas, and any other surfaces situated between the street right-of-way lines.

All disturbed surfaces shall be restored on CTDOT roads between the right-of-way lines and shall include those surfaces described above.

Unimproved easement is easement on lands which is maintained as manicured lawn.

All work on the site must comply with CTDOT rules and regulations.

S 8.02 PAVEMENT RESTORATION

After trench backfill has been completed, as hereinbefore specified, the Contractor shall complete pavement restoration as follows:

- A. The pavement shall be milled approximately 6" wider than the pavement saw cut edge and tack coated, refer to contract documents for payment limits.
- B. Ten (10) inches of CTDOT approved processed stone will be installed to 9" within the top of the existing pavement. The processed stone shall be compacted every 5

inches. Suitable excavated material will be allowed as backfill material upon approval of the Design Engineer.

- C. Six (6) inches of bituminous concrete hot mixed asphalt superpave 1.0 shall be placed, within 3" of the top of existing pavement, and shall be compacted in two (2) 3" thick lifts.
- D. The existing saw cut edge of the pavement will be tack coated.
- E. Three (3) inches of bituminous concrete hot mixed asphalt superpave 0.5 shall be compacted in two (2) 1.5' thick lifts.

The surface of the completed permanent pavement shall be smooth, with no visible difference in elevation where made flush with existing pavement. There shall be no low or settled areas which will permit the puddling of water upon being wetted down. The visible edge of the permanent pavement shall be in a straight line matching the edge of the previously placed tack coat.

The pavement materials described above shall not be placed when atmospheric temperature is below 40°F or when the weather is foggy, rainy, or otherwise unfavorable in the opinion of the Engineer. During winter periods, when hot mix pavement materials are not available, a suitable cold weather pavement material shall be used as temporary pavement. Such cold weather materials shall meet with the approval of the CTDOT and shall be stockpiled locally in sufficient quantities, for use in emergency repairs. Such cold weather materials shall be removed and replaced with the previously specified base course before placing permanent pavement.

The Contractor shall remove all pavement damaged by his operations, or which has settled as a result of the trenching operations, and replace such pavement with the sub-base course, base course, and surface course specified above.

The thickness of all courses, as specified herein, shall mean the thickness of such course after compaction with a three-wheel 10 ton power roller, or equal.

S 8.04 RESTORATION IN STATE ROADWAYS

The Contractor shall replace, restore, and reconstruct all surfaces and structures, including curbs, driveways, grassed areas and all other surfaces and structures disturbed by him on account of his work in state roadways. All restoration of surfaces and structures between the right-of-way lines shall meet the requirements of the state.

All grassed areas disturbed by the Contractor shall be restored by placement of a 4-inch layer of topsoil and followed by hydroseeding as approved by the State Permit Investigator.

S 8.06 MILLING

The milling machine shall be a self-propelled planing, grinding or cutting machine with variable operating speeds, capable of removing bituminous concrete without the use of heat.

The milling machine shall be equipped with automatic grade controls. The reference system may be either stringline or ski type. Use of the automatic grade controls will be required except at intersections and other locations where it is not practical.

Teeth in the milling drum that become dislodged, broken, or unevenly worn shall be replaced immediately with teeth of the same length as the remaining teeth in that row.

Upon completion of the required trench settling period, the CONTRACTOR is responsible for pavement restoration which shall include, but not be limited to, where trenches were constructed for sanitary sewer appurtenances, construction of milling and placement of bituminous concrete surface course to meet the existing surface course material.

A test strip of approximately 500 square yards shall be constructed within the proposed limits of milling prior to commencement of the milling operations. The test strip shall be used to determine the machine drum speeds of operation which will produce the proper surface texture and when profile milling is called for, to determine the cutting depth required to remove ruts and transverse corrugations.

The milling operation may begin when the above criteria have been established and approved. The machine shall be operated at the speeds and cutting depth determined during the test strip milling. Test strips shall be constructed for each milling machine used. If the area to be milled is less than 2500 square yards, a test strip may not be required.

The milling operation, including removal and disposal of the milled material, shall be carried out in a manner that will prevent dust and other particulate matter from escaping in the air.

If the milled material is to be recycled, the milling equipment, where practical, shall be operated in such a manner as to produce milled material of which 95 percent will pass a 2-1/2 inch sieve.

If the milled material is to be recycled, the area of milling shall be cleared of all debris and power broomed to remove fine particles prior to milling. Before grooming, earth berms shall be removed, as necessary, within the area to be milled to prevent soil and grass from contaminating the milled material.

Milling shall start at the low side of the cross section and progress toward the high side. Provisions shall be made for removal of any water that may be trapped due to the milling operations, such as by lateral saw cuts into the shoulder area. In the event that all milled areas which are opened to traffic have not been milled to a flush surface by the end of the work day, the longitudinal edges of the milled area, exceeding 1-1/2 inches high, shall be sloped and a smooth transition shall be provided at the transverse edge.

Areas to be milled not accessible to the milling machine shall be removed by other equipment.

Bituminous concrete below the specified level of milling that becomes dislodged or delaminated shall be removed and replaced with bituminous concrete without additional compensation. Grading and proof rolling of subbase shall also be included, if required.

The surface of the milled area shall be swept clean prior to being opened to traffic and prior to the following construction or resurfacing stage. Sweepings shall be legally disposed of by the Contractor.

The milled area that will be opened to traffic before resurfacing shall be free from gouges, continuous grooves, ridges and delaminated areas and shall have a uniformly textured appearance consisting of discontinuous longitudinal striations which shall not deviate more than 1 inch in 200 feet from a line parallel to the center of the traveled way and shall not exceed 3/8 inch depth and which shall provide a skid resistance not less than that of the original surface prior to milling and shall permit passage of traffic at the posted speed limit without vehicle operations experiencing impaired directional control.

The depth of milling shall be established in the field by the Engineer's representative, but shall in no case exceed 3 inches.

Milling beyond the depth established in the field by the Engineer's representative will be replaced by the Contractor with stabilized base, bituminous concrete leveling course or aggregate, as conditions require, without additional compensation. Grading and proofrolling of surface shall also be included as required. Any additional excavation and subgrade material requirement to establish a firm paving subbase required as a result of this excess milling will also be repaired by the Contractor without additional compensation.

All excess material is to be removed and disposed of by the Contractor.

Bituminous Surface Course shall be placed within 72 hours of the milling.

Any existing curbing that becomes dislodged or damaged as a result of the milling operation shall be repaired, replaced or reset by the Contractor at no additional compensation, as directed by the Engineer.

The Contractor shall coordinate all pavement markings with the local Police Department and the CTDOT.

S 8.07 PERMITTING

1. Instructions for submitting for state permits are attached to these specifications as well as the fees, bonding amount, and insurance requirements.
2. Contractor is responsible for all fees, bonds, and insurance which shall be included in the price of the contract.
3. Bond requirements shall be determined by the State.
4. Contractor shall be advised that bonds and insurance may be required to be maintained for up to one (1) year after initial and temporary restoration is performed.

S 8.08 TESTS AND INSPECTIONS

Tests and inspections for the acceptance of materials and equipment, or Work, shall be conducted in accordance with the Contract Documents, with attention to the General Conditions.

S 8.09 SUBMITTALS

Certifications. Tests and Inspections required under this Section shall be certified in accordance with the Contract Documents, and shall be submitted for review by ENGINEER in accordance with the General Conditions.

1. An approved Connecticut Department of Transportation Mix Design shall be submitted for all bituminous concrete. The approved design shall be submitted to the Engineer prior to the installation of any material.

Other Submittals. Other submittals required are as follows:

1. An approved Connecticut Department of Transportation Mix Design shall be submitted for all concrete. The approved design shall be submitted to the Engineer prior to the installation of any material.
2. All deliveries of concrete shall be accompanied by delivery slips conforming to ASTM C-94 and shall show:
 - a. Name of ready-mix batch plant
 - b. Serial number of ticket
 - c. Date
 - d. Truck number
 - e. Name of purchaser
 - f. Specific designation of job (name and location)
 - g. Specific class or designation of the concrete in conformance with that employed in job
 - h. Amount of concrete in cubic yards
 - i. Time loaded or of first mixing of cement and aggregates
 - j. Water added by receiver of concrete and his initials
 - k. Type and brand, and amount of cement
 - l. Type and brand, and amount of admixtures
 - m. Signature or initials of ready-mix representative

END OF SECTION S-8

**SECTION S-9
INDIVIDUAL PUMP STATION (PRIVATELY OWNED)**

S 9.01 WORK INCLUDED

The following principal items of work are included in this item(s):

- 1) Clearing and grubbing of the site, stockpiling of topsoil.
- 2) Installation of soil erosion controls.
- 3) Protection of public and private property.
- 4) Grading of the site.
- 5) Furnishing and installation of the wet well, pumps, valves and associated piping.
- 6) Furnishing and installation of concrete pads for various equipment.
- 7) Installation of hydrant and backflow prevention device including but not limited to coordination with Water purveyor.
- 8) Furnishing and installation of gravity sewer pipe and manholes within the limits shown on the drawings.
- 9) Extensions to and connection to existing off-site electric and telephone utility.
- 10) All interconnecting piping, valves and fittings.
- 11) Fencing, pavement, ground cover, plantings and other site amenities indicated.
- 12) Force main piping to the limits indicated.
- 13) Restoration of all disturbed surfaces.
- 14) Test all installations and obtain approval of the Engineer.
- 15) Excavation, excavation support system and dewatering system and design of such systems by a licensed professional engineer.

S 9.02 WORK NOT INCLUDED

This Item includes all work described in or payable under other items of this contract. See Electrical and Instrumentation Construction item for remaining work included with the pump stations.

S 9.03 GENERAL REQUIREMENTS

Work under this item shall conform to the following General Specifications:

- S-01 – Earthwork and Backfill
- S-7 – Valves
- S-16 – Hot Mix Asphalt Paving
- S-17 – Cast-in-Place Concrete
- S-18 – Precast Concrete Structures
- S-19 – Grout
- S-20 – Access Doors

- S-21 – Shop Painting
- S-22 – Field Painting
- S-23 – Pumps and Appurtenances

NOTE: All work in underground chambers to be performed using appropriate confined space requirements. As a minimum, the Contractor shall use approved gas meters, harnesses, radios (above and below grade) trained surface emergency personnel, A-frame hoists, etc. Procedures must meet requirements of the Authority's Regulations, State regulations, OSHA, or the Engineer's requirements. All costs of confined space entry shall be included in the prices bid.

S 9.04 METHOD OF MEASUREMENT

The pump station construction shall be measured by the lump sum. Items of work covered by this bid item are as indicated on the drawing as limit of work or as described in the specifications.

S 9.05 BASIS OF PAYMENT

Payment for the lump sums shall be based upon the completion of work identified in a schedule of values to be agreed upon between the engineer and contractor.

END OF SECTION S-9

SECTION S-10 ADMINISTRATIVE REQUIREMENTS

S 10.01 SECTION INCLUDES

- (1) Preconstruction meeting.
- (2) Site mobilization meeting.
- (3) Progress meetings.
- (4) Construction progress schedule.

S 10.02 PROJECT COORDINATION

The contractor shall be the project coordinator. The contractor shall cooperate with the WPCA in allocation of mobilization areas of site; for material storage, vehicular access, traffic, and parking facilities. During construction, the contractor shall maintain access to neighboring facilities. The contractor shall comply with WPCA procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts. The contractor shall comply with instructions of the WPCA for use of temporary utilities and construction facilities.

The contractor shall coordinate field engineering and layout work under instructions of the WPCA.

- A. Make the following types of submittals to the Engineer:
 1. Requests for interpretation and/or information.
 2. Requests for substitution.
 3. Shop drawings, product data, and samples.
 4. Test and inspection reports.
 5. Manufacturer's instructions and field reports.
 6. Applications for payment and change order requests.
 7. Progress schedules.
 8. Coordination drawings.
 9. Closeout submittals.

S 10.03 PRECONSTRUCTION MEETING

- A. WPCA will schedule a meeting after Notice of Award.
- B. Attendance Required:
 1. WPCA.
 2. Langan.
 3. Professional Consultants (as required).

4. General Contractor.
 5. Major Subcontractors.
- C. Agenda:
1. Execution of Agreement.
 2. Submission of executed bonds and insurance certificates.
 3. Distribution of Contract Documents.
 4. Submission of list of Subcontractors, list of Products, schedule of values, submittal schedule and construction schedule.
 5. Designation of personnel representing the parties to Contract, Langan, and their consultants.
 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 7. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with one copy to Langan, WPCA, participants, and those affected by decisions made.

S 10.04 SITE MOBILIZATION MEETING

- A. The WPCA will schedule a meeting at the Project site prior to commencement of construction.
- B. Attendance Required:
1. WPCA.
 2. Langan.
 3. Professional Consultants (as required).
 4. General Contractor.
 5. Major Subcontractors.
 6. Construction Manager.
- C. Agenda:
1. Use of premises by relevant parties.
 2. WPCA requirements.
 3. Construction facilities and controls.
 4. Temporary utilities.
 5. Survey and layout.
 6. Security and housekeeping procedures.
 7. Schedules.
 8. Application for payment procedures.
 9. Procedures for testing.
 10. Procedures for maintaining record documents.
 11. Requirements for start-up of equipment.
 12. Inspection and acceptance of equipment put into service during construction period.
 13. Utility location.

- D. The Contractor will record minutes and distribute copies within two days after meeting to participants, with one copy to Langan, WPCA participants, and those affected by decisions made.

S 10.05 PROGRESS MEETINGS

- A. The contractor will schedule and administer meetings throughout progress of the Work at maximum intervals of one per month.
- B. The contractor will make arrangements for meetings, prepare agenda with copies for participants that preside at meetings.
- C. Attendance Required:
 - 1. WPCA.
 - 2. Langan.
 - 3. Professional Consultants (as required).
 - 4. General Contractor.
 - 5. Major Subcontractors.
 - 6. Construction Manager.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems or concerns, including those that impede, or will impede, planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Review of off-site fabrication and delivery schedules.
 - 7. Maintenance of progress schedule.
 - 8. Corrective measures to regain projected schedules.
 - 9. Planned progress during succeeding work period.
 - 10. Coordination of projected progress.
 - 11. Maintenance of quality and work standards.
 - 12. Effect of proposed changes on progress schedule and coordination.
 - 13. Other business relating to Work.
- E. The contractor will record minutes and distribute copies within two days after meeting to participants with copies to all attendees, General Contractor and those affected by decisions made.

S 10.06 CONSTRUCTION PROGRESS SCHEDULE

Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work. If preliminary schedule requires revision after review, submit revised schedule within 10 days. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review. Include written certification that major contractors have reviewed and accepted proposed schedule.

Within 10 days after joint review, submit complete schedule. Submit updated schedule with each Application for Payment.

END OF SECTION S-10

SECTION S-11 SITE PREPARATION

PART 1 GENERAL

S 11.01 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

S 11.02 WORK INCLUDED

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete the Site Preparation as shown on the drawings and specified herein, including, but not limited to, the following:
 1. Installation of erosion control devices as shown on drawings.
 2. Clearing and grubbing.
 3. Removal of structures, obstructions and utilities.
 4. Protection of existing structures and utilities to remain.
 5. Protection of existing trees, landscaping and natural features to remain.

S 11.03 EXISTING UTILITY

- A. The contractor shall have all existing utilities on the project site located by a qualified Utility Locator Company. This effort must be completed prior to the start of work and the results provided to the Engineer for review prior to ordering any materials. All costs associated with this effort shall be included in the Contract.

S 11.04 QUALITY ASSURANCE

- A. The Contractor shall perform all his operations in accordance with the rules, regulations and ordinances of those governing bodies having jurisdiction.

S 11.05 SUBMITTALS

- A. The Contractor shall submit a schedule of his proposed methods and operations of Site Preparation for review and approval prior to start of Work.

S 11.06 DELIVERY, STORAGE & HANDLING (NOT USED)

S 11.07 JOB CONDITIONS

- A. Locations shown on Drawings not Guaranteed
 1. The structures, obstructions, utilities, trees and shrubs shown on the Drawings are those known to exist, but their location is not guaranteed to be exact, nor is it guaranteed that all structures,

obstructions, utilities, trees and shrubs are shown. The Contractor shall, however, be responsible for the protection of all structures, obstructions, utilities, trees and shrubs, whether shown on the Drawings or not.

2. Should any discrepancy be found between points, lines or grades shown on Drawings and actual field conditions, the Contractor shall immediately inform the Design Engineer of such discrepancy and shall not proceed with the work affected thereby until necessary instructions are received from the Contract and Design Engineer.

B. Safeguards and Protection

1. The Contractor shall provide all necessary safeguards including the installation of shoring, structural supports, protective fencing and barriers, etc., as may be required to prevent damage to adjacent property or injury to persons. All Work shall be performed in accordance with the requirements of the local building codes and the rules, regulations and ordinances of all other governing bodies having jurisdiction. The Contractor will be held responsible for any claim arising from his failure to provide proper safeguards or for his failure to conduct his operation in a manner consistent with the rules, regulations and ordinances of these governing bodies having jurisdiction.

C. Replacement of Disturbed Ground Surfaces

1. The Contractor shall at his own expense, repair or replace all ground surfaces, pavements, sidewalks, curbs, etc., which are to remain and which may become disturbed or damaged due to his operations. Said repair or replacement shall be satisfactory to the Contract and Design Engineer and in accordance with the requirements of the governing bodies having jurisdiction.

D. Damage

1. The Contractor, at his own expense, shall make good, repair and/or replace all damage occurring as a direct or indirect result of his operations.

E. Notification of Utility Owners

1. The Contractor shall notify all utility owners at least seventy-two (72) hours prior to the start of any operation that will affect utilities, whether to remain or to be discontinued, removed, relocated and/or reconstructed and at all other times as may be specified by law. The Contractor will be held responsible for any claims arising from his failure to make such notification, or for his failure to do the work in accordance with the rules and regulations of the governing authorities.

F. Demolition

1. All structures and buildings designated for disposal shall be

demolished onsite. Unless otherwise specified, the salvage value of all materials in these structures and buildings shall accrue to the Contractor and shall be reflected in the Proposal.

G. Cleaning

1. Upon completion of site preparation and prior to commencing site construction, clean areas within contract limits, remove tools and equipment. Provide site clear, clean, and free of materials and debris, and suitable for earthwork operations.

S 11.08 WARRANTY (NOT USED)

PART 2.00 PRODUCTS

S 11.09 MATERIALS DEFINITIONS

- A. Construction signs, lights, flares, barricades and protective devices shall conform to the "Manual of Uniform Traffic Control Devices".
- B. Materials for construction access and staging areas shall conform to the appropriate sections of the specifications.

PART 3.00 EXECUTION

S 11.10 INSPECTION

- A. Examine the areas and conditions where Site Preparation is to be performed and notify the WPCA of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until satisfactory conditions have been corrected by the Contractor in a manner acceptable to the Contract and Design Engineer.

S 11.11 INSTALLATION

- A. Stakeout of Site Layout and Grading:
 1. General Requirements
 - (a) The Contractor shall engage a licensed professional surveyor approved by the Contract and Design Engineer to stakeout the proposed work throughout the construction period.
 - (b) Maintain all benchmarks, monuments, and any other existing or newly established reference points. Replace them if they are disturbed or destroyed.
 - (c) Locate, protect and maintain active utilities and site improvements to remain.
 2. Stake-out
 - (a) The surveyor shall provide and maintain staking throughout the construction period as required for the accurate

construction of each stage of work, subject to Contract and Design Engineer inspection and approval.

- (b) Stake out locations of drainage and utility structures and changes of direction of drainage utility lines, horizontal alignments, edges and curbs of paved areas, and all other elements to be constructed or installed to the dimensions specified on the Drawings.
- (c) Set inverts of underground utilities.
- (d) Set top of base elevations as required for utility structures, walls, curbs, fences, paving, pads, slabs, equipment, signs, lights and other improvements to be constructed or installed.
- (e) Make field adjustments in lines and levels as required.

3. Inspection

- (a) On completion of stakeouts, prior to start of clearing, the Owner's Field Representative shall make a field inspection.
- (b) At this time, the Contract and Design Engineer reserve the right to:
 - (1) Adjust the location of the layouts to minimize damage to trees to remain and areas to be left undisturbed.

B. Clearing and Grubbing

1. General Requirements:

Clear and grub within Contract limits or limit of disturbance as required for utilities installation and execution of the work. Clearing and grubbing work includes, but is not limited to: the removal of trees, brush, stumps, wooded growth, grass, shrubs, poles, posts, signs, fences, culverts and other vegetation and minor structures; the protection of designated wooded growth; the storage and protection of minor structures and materials which are to be replaced; the disposal of non-salvageable structures and materials; necessary preliminary grading; and the removal of rubbish and other perishable or objectionable materials, as directed by the Contract and Design Engineer.

- (a) Remove stumps and roots to a clear depth of 36", unless otherwise approved by the engineer, below existing grade. Remove stumps and roots to their full depth within 5'-0" of underground structures, utility lines, footings and paved areas.
- (b) Protection of Wooded Growth:

1. Fell trees in a manner to prevent injury to adjacent facilities and trees and shrubs to remain.
 2. Cut up, remove, and dispose of trees unavoidably falling outside the area to be cleared.
 3. Employ skilled workmen or tree surgeons to trim and repair all trees that are damaged but are to be left standing and paint all cut surfaces with an approved bituminous paint.
- (c) Limit clearing and grubbing for utility corridors and access ways to area widths determined by the Contract and Design Engineer as necessary for proper installation and reasonable access.
- (d) Restore materials and structures to be replaced to their original condition and location as closely as possible.
- (e) Repair any damage to structures using the same materials contained in the structures, to the complete satisfaction of the Contract and Design Engineer.
2. Preparation:
- (a) Carefully preserve and protect from injury all trees and/or shrubs marked to be saved.
- (b) Right-of-Way:
1. Where excavation is required on public or private rights-of-way containing trees, shrubs, other growth, or any structure or construction, obtain the Contract and Design Engineer direction concerning the extent to which such obstacles can be cleared or stripped prior to performing work.
 2. In all rights-of-way, remove only those particular growths or structures which are, in the opinion of the Contract and Design Engineer, essential for construction operations.
 3. All other removals or damage shall be replaced or restored at the Contractor's expense.
 4. No work within public right-of ways shall be performed until municipal or State approvals are obtained.
3. Disposal
- (a) All material obtained from clearing and grubbing shall become the property of the Contractor and, unless otherwise specified, shall be disposed of offsite in an approved disposal site, in accordance with all applicable local and state laws, ordinances, and code requirements.

- (b) Accumulation is not permitted. Dispose of material to be removed daily as it accumulates. Maintain disposal routes clear, clean and free of debris.
 - (c) Remove and dispose offsite all tree protection materials at end of construction period as determined by the Contract and Design Engineer.
4. Replacement of Materials: Properly store and preserve all material to be replaced in a location approved by the Contract and Design Engineer.
- (a) Shrubs and Bushes: Remove, store and replace ornamental shrubs and bushes to be preserved in accordance with accepted horticultural practices.
 - (b) Topsoil: Carefully remove, store, and protect topsoil.
 - (c) Responsibility: Replace, at no additional cost to the WPCA, materials lost or damaged because of careless removal or neglectful or wasteful storage, disposal or use of these materials.

C. Removal of Structures, Utilities and Obstructions

1. General Requirements

- (a) The Contractor shall remove and dispose of those existing structures, utilities and obstructions which interfere with the proposed construction as shown on the Drawings, and as determined in the field by the Contract and Engineer. This shall include, but not necessarily be limited to, buildings and building foundations, fences, guide rails, walls, poles, pole bases, catch basins, inlets, manholes, vaults, tanks, conduit, pipes and appurtenances, floor slabs, pavements, sidewalks, curbs, signs and sign supporting structures.
- (b) The Contractor shall remove only those items and structures that he has been authorized to remove, either by specific directions given on the Drawings or by written instructions given before or during the progress of the Work by the Engineer or the WPCA.
- (c) The Contractor will be held responsible for any claim arising from his removal of any existing item or structure without the required authorization specified herein.

2. Portions of Pavements, Curbs, etc., to Remain

- (a) In removing portions of pavements, curbs, sidewalks, driveways and similar items where other portions of such items are to remain, removal shall be to an existing joint. Where this is not practical, as determined by the WPCA,

removal shall be to a reasonably true line with vertical face, which shall be cut with a power driven concrete saw or by other approved mechanical line cutting methods.

3. Disposal of Material

- (a) All waste material obtained from the removal of structures and obstructions, including, but not limited to, concrete matted together by reinforcing, plaster, wood, paper, asphalt shingles, tanks, metal and miscellaneous debris, shall be disposed of offsite.

D. Protection of Existing Structures and Utilities

1. General Requirements

- (a) The Contractor shall be responsible throughout the course of the Work for protection from injury or damage of all existing structures and utilities, which are to remain.
- (b) All existing gas and water lines, telegraph, telephone and electric poles, wires, conduits, sewers, drains, culverts, fire hydrants and other utilities which are to remain shall be carefully supported, maintained in operation and protected from injury or damage by the Contractor.
- (c) The Contractor shall sling, support, shore up and secure in place all pipe or conduits, without damage thereto. The Contractor shall provide for and maintain, by means of suitable temporary channels or pipe, the flow of drainage and watercourses, whether on the surface or underground, which may be interrupted during the progress of the Work. All Works of drainage intercepted or disconnected, shall be restored and/or rebuilt to the extent made necessary by the new Work, and all temporary material required for such construction shall immediately be removed therefrom when no longer required.

2. Dead-End Pipe and/or Conduit to be sealed

- (a) When pipe, conduits or sewers are removed from trenches, leaving dead ends in the ground, the Contractor shall carefully plug or bulkhead such ends with brick and mortar or in such other manner as may be satisfactory to the Owner's Field Representative or representatives of the utility owner.

E. Protection of Existing Landscaping and Natural Features

1. General Requirements

- (a) The Contractor shall protect, throughout the course of construction, all such trees as are shown on the Drawings

or marked by the Contract and Design Engineer as to be protected, from damage and harmful occurrences including:

- (1) Compaction of root area by moving trucks or heavy equipment.
 - (2) Storage of heavy equipment, supplies, gravel, and earth fill within the drip-line of trees and shrubs.
 - (3) Trunk damage by leaning supplies and equipment against trees.
 - (4) Nailing, screwing, or bolting objects to trees other than protective barriers.
 - (5) Strangulation by attaching ropes, guy wires, or power lines to trunks or branches.
 - (6) Poisoning by spilling or discarding noxious paint, cement, solvents, oil, and gasoline around trees and roots; or by runoff of such material from other areas.
 - (7) Avoid cutting of roots in the process of excavation for trenching.
 - (8) Damage to branches by temporary overhead lines.
 - (9) Damage by moving vehicles and equipment.
 - (10) Improper pruning to allow for construction.
 - (11) Damage to root system by flooding and ponding caused by grade changes.
 - (12) Damage to root system from mud or silt buildup from construction area drainage.
- (b) The Contractor shall also protect throughout the course of construction all landscaping, vegetation and natural features on public and private property. The Contractor shall use every precaution to prevent injury, damage, pollution, erosion or destruction of existing landscaping, vegetation and natural features, including, but not limited to drainage-ways, ponds, lakes, swamps, woods and fields.

2. Protective Fencing

- (a) The Contractor shall protect trees, shrubs and areas to be left undisturbed with armoring and fencing. Place the protective barriers before any excavation or grading has begun and maintained and repaired throughout the construction period.
- (b) Fencing shall be located at the drip-line of trees to be protected unless otherwise approved by Contract and Design Engineer. If it is necessary to reduce the distance between fencing and tree trunk as determined by Contract

and Design Engineer, the minimum distance between fence and tree trunk shall be determined by the caliper of the tree to be protected. For each inch of tree caliper, the fence shall be 12" distant with a minimum of 18".

- (1) Armoring - Wrap individual trees near heavy construction traffic with burlap and 2"x 4" planks of sound durable wood wired vertically as armor around trunks, spaced no more than 2" apart, to a height of 10' above ground.
- (2) Barrier Fencing - Protect groups of trees and shrubs near construction traffic by fencing which shall have posts equivalent to 4"x 4" set 3' in the ground and extending 5' above the ground, set at intervals not to exceed 8'. Provide two rails equivalent to 1"x 6" and verticals 1"x 5" attached no more than 6" apart.
- (3) Snow Fencing - Protect other individual trees and shrubs liable to damage with standard 48" high snow fencing attached to 6' long standard steel drive posts set no more than 6' on center.
Protect areas to be left undisturbed and liable to damage with perimeter snow fencing as described above.

3. Root Protection

- (a) The Contractor shall protect existing root systems by maintaining existing grades, within the canopy spread of trees and shrubs to remain, except for grading work approved by the Contract and Design Engineer.
- (b) Inspect trees and shrubs to remain immediately after rains and during periods of runoff for ponding and silting. Drain area and remove mud and silt to existing grade immediately.

4. Tree Wells

- (a) Where designated by the Drawings or Contract and Design Engineer, the Contractor shall protect trees which will require future walls or wells due to grade changes by holding the existing grade under the drip-line of the trees' branches. The trees will also be protected with fencing as directed by the Contract and Design Engineer.

F. Maintenance and Protection of Traffic

1. General Requirements

- (a) The Contractor shall maintain traffic as required during the course of construction in such a manner satisfactory to the WPCA and authorities having jurisdiction. The Contractor shall comply with all rules and regulations of those

governing bodies having jurisdiction on the adjacent roadways, and shall obtain required permits and pay all fees, deposits and charges in connection with same.

2. Conduct of Work

- (a) The Contractor shall furnish, install and maintain construction signs, lights, flares, fences, barricades, steel plates, and/or all other protective devices necessary and required to adequately maintain both vehicular and pedestrian traffic during construction. He shall provide all personnel necessary for directing and controlling traffic. Traffic entering and exiting the site shall be regulated and maintained so as not to disrupt the normal flow of highway traffic. Emergency personnel and equipment shall have safe and adequate access at all times to the site.

END OF SECTION S-11

SECTION S-12 PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

S 12.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

S 12.02 SUMMARY

- B. This Section includes administrative and procedural requirements for the following:
 - 1. Pre-construction photographs.
 - 2. Pre-construction videotapes.

S 12.03 SUBMITTALS

- A. Qualification Data: For photographer.
- B. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Include same label information as corresponding set of photographs.
- C. Construction Photographs: Submit two prints of each photographic view within seven days of taking photographs.
 - 1. Format: 8-by-10-inch smooth-surface matte prints on single-weight commercial-grade photographic paper, enclosed back to back in clear plastic sleeves that are punched for standard 3-ring binder.
 - 2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:
 - a. Name of Project.
 - b. Name and address of photographer.
 - c. Name of Engineer.
 - d. Name of Contractor.
 - e. Date photograph was taken if not date stamped by camera.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - g. Unique sequential identifier.

- D. Videotapes: Submit two copies of each videotape with protective sleeve or case within seven days of recording. Remove safety tab to prevent accidental re-recording.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of photographer.
 - c. Name of Engineer.
 - d. Name of Contractor.
 - e. Date videotape was recorded.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - g. Weather conditions at time of recording.

S 12.04 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

S 12.05 COORDINATION

- A. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities, including temporary lighting required to produce clear, well-lit photographs without obscuring shadows.

S 12.06 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - EXECUTION

S 12.07 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified commercial photographer to take construction photographs.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Film Images:
1. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.
 2. Field Office Prints: Retain one set of prints of progress photographs in the field office at Project site, available at all times for reference. Identify photographs same as for those submitted to Engineer.
- D. Pre-Construction Photographs: Before starting construction, take color photographs of Project site and surrounding properties, from different vantage points, as directed by Engineer.

S 12.08 CONSTRUCTION VIDEOTAPES

- A. Videotape Photographer: Engage a qualified commercial videographer to record construction videotapes.
- B. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of construction. Display continuous running time and date. At start of each videotape, record weather conditions from local newspaper or television and the actual temperature reading at Project site.
- C. Preconstruction Videotape: Before starting construction, record videotape of Project site and surrounding properties from different vantage points, as directed by Engineer.

PART 3 - PAYMENT

S 12.09 BASIS OF PAYMENT

- A. No separate payment will be made for Photographic Documentation. All work described in this section will be paid for in the prices bid for various items in the Schedule of Prices.

END OF SECTION S-12

SECTION S-13 TREE PROTECTION AND TRIMMING

PART 1 - GENERAL

S 13.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

S 13.02 SUMMARY

- A. This Section includes the protection and trimming of existing trees that interfere with, or are affected by, execution of the Work, whether temporary or permanent construction.
- B. Related Sections include the following:
 - 1. S-11 "Site Preparation" for removal limits of trees, shrubs, and other plantings affected by new construction.

S 13.03 DEFINITIONS

- A. Tree Protection Zone: Area surrounding individual trees or groups of trees to remain during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

S 13.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Tree Pruning Schedule: Written schedule from arborist detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
- C. Qualification Data: For tree service firm and arborist.
- D. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- E. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

S 13.05 QUALITY ASSURANCE

- A. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of tree protection and trimming.
- B. Arborist Qualifications: An arborist certified by ISA or licensed in the jurisdiction where Project is located.
- C. Tree Pruning Standard: Comply with ANSI A300 (Part 1), "Tree, Shrub, and Other Woody Plant Maintenance--Standard Practices (Pruning)."
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
 - 1. Before tree protection and trimming operations begin, meet with representatives of authorities having jurisdiction, WPCA, Langan, and other concerned entities to review tree protection and trimming procedures and responsibilities.

PART 2 - PRODUCTS

S 13.06 MATERIALS

- A. Drainage Fill: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D 448, Size 24, with 90 to 100 percent passing a 2-1/2-inch sieve and not more than 10 percent passing a 3/4-inch sieve.
- B. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than [**2 inches (50 mm)**] [**1 inch (25 mm)**] in diameter; and free of weeds, roots, and toxic and other nonsoil materials.
 - 1. Obtain topsoil only from well-drained sites where topsoil is 4 inches (100 mm) deep or more; do not obtain from bogs or marshes.
- C. Filter Fabric: Manufacturer's standard, nonwoven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers.
- D. Chain-Link Fence: Metallic-coated steel chain-link fence fabric of 0.120-inch- (3-mm-) diameter wire; a minimum of 48 inches (1200 mm) high; with 1.9-inch- (48-mm-) diameter line posts; 2-3/8-inch- (60-mm-) diameter terminal and corner posts; 1-5/8-inch- (41-mm-) diameter top rail; and 0.177-inch- (4.5-mm-) diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.

- E. Organic Mulch: [Shredded hardwood] [Ground or shredded bark] [Wood and bark chips], free of deleterious materials.

PART 3 - EXECUTION

S 13.07 PREPARATION

- A. Temporary Fencing: Install temporary fencing around tree protection zones to protect remaining trees and vegetation from construction damage. Maintain temporary fence and remove when construction is complete.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- C. Mulch areas [inside tree protection zones] [and] [within drip line of trees to remain] and other areas indicated.
 - 1. Apply [2-inch (50-mm)] [3-inch (75-mm)] average thickness of organic mulch. Do not place mulch within [6 inches (150 mm)] <Insert measurement> of tree trunks.
- D. Do not store construction materials, debris, or excavated material inside tree protection zones. Do not permit vehicles or foot traffic within tree protection zones; prevent soil compaction over root systems.
- E. Maintain tree protection zones free of weeds and trash.
- F. Do not allow fires within tree protection zones.

S 13.08 EXCAVATION

- A. Install shoring or other protective support systems to minimize sloping or benching of excavations.
- B. Do not excavate within tree protection zones, unless otherwise indicated.
- C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.
 - 1. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location

- of new construction and redirection is not practical, cut roots approximately 3 inches (75 mm) back from new construction.
2. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
- D. Where utility trenches are required within tree protection zones, tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.
1. Root Pruning: Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with sharp pruning instruments; do not break or chop.

S 13.09 REGRADING

- A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade beyond tree protection zones. Maintain existing grades within tree protection zones.
- B. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist, unless otherwise indicated.
1. Root Pruning: Prune tree roots exposed during grade lowering. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots with sharp pruning instruments; do not break or chop.
- C. Minor Fill: Where existing grade is 6 inches (150 mm) or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.
- D. Moderate Fill: Where existing grade is more than 6 inches (150 mm) but less than 12 inches (300 mm) below elevation of finish grade, place drainage fill, filter fabric, and topsoil on existing grade as follows:
1. Carefully place drainage fill against tree trunk approximately 2 inches (50 mm) above elevation of finish grade and extend not less than 18 inches (450 mm) from tree trunk on all sides. For balance of area within drip-line perimeter, place drainage fill up to 6 inches (150 mm) below elevation of grade.
 2. Place filter fabric with edges overlapping 6 inches (150 mm) minimum.
 3. Place fill layer of topsoil to finish grade. Do not compact drainage fill or topsoil. Hand grade to required finish elevations.

S 13.10 TREE PRUNING

- A. Prune trees to remain that are affected by temporary and permanent construction.

- B. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
- C. Pruning Standards: Prune trees according to ANSI A300 (Part 1)
- D. Cut branches with sharp pruning instruments; do not break or chop.
- E. Chip removed tree branches and dispose of off-site.

S 13.11 TREE REPAIR AND REPLACEMENT

- A. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
- B. Remove and replace trees indicated to remain that die or are damaged during construction operations that WPCA determines are incapable of restoring to normal growth pattern.
 - 1. Provide new trees of same size and species as those being replaced; plant and maintain as specified in Division 2 Section "Exterior Plants."
 - 2. Provide new trees of 6-inch (150-mm) caliper size and of a species selected by Architect when damaged trees more than 6 inches (150 mm) in caliper size, measured 12 inches (300 mm) above grade, are required to be replaced. Plant and maintain new trees as specified in Division 2 Section "Exterior Plants."
- C. Aerate surface soil, compacted during construction, 10 feet (3 m) beyond drip line and no closer than 36 inches (900 mm) to tree trunk. Drill 2-inch- (50-mm-) diameter holes a minimum of 12 inches (300 mm) deep at 24 inches (600 mm) o.c. Backfill holes with an equal mix of augered soil and sand.

S 13.12 DISPOSAL OF WASTE MATERIALS

- A. Burning is not permitted.
- B. Disposal: Remove excess excavated material and displaced trees from Owner's property. All material is the property of the contractor and shall be disposed of Off-site.

END OF SECTION S-13

SECTION S-14 DEWATERING

PART 1 - GENERAL

S 14.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

S 14.02 SUMMARY

- A. This Section includes construction dewatering.
- B. Related Sections include the following:
 - 1. S1A "Earthwork and Backfill within Wetland and Watercourse Areas."
 - 2. S1B "Earthwork and Backfill within Wetland and Watercourse Areas."
 - 3. S4 "Piper, Supports, and Appurtenances."
 - 4. S5 "Manholes and Chambers."

S 14.03 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control ground-water flow into excavations and permit construction to proceed on dry, stable subgrades.
 - 1. Maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrades and permanent structures is prevented.
 - 2. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 3. Accomplish dewatering without damaging existing buildings adjacent to excavation.
 - 4. Remove dewatering system if no longer needed.

S 14.04 SUBMITTALS

- A. Field Test Reports: Before starting excavation, submit test results and computations demonstrating that dewatering system is capable of meeting performance requirements.

S 14.05 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with water disposal requirements of the state of Connecticut and Brookfield IWC Permit.

S 14.06 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated.
- B. Project-Site Information: A geotechnical report has been prepared and a copy of this report is included in Appendix A. Owner will not be responsible for interpretations or conclusions drawn from this data.
 - 1. The Contractor shall make additional test borings and conduct other exploratory operations necessary for dewatering.
- C. Survey adjacent structures and improvements, employing a qualified professional engineer or land surveyor, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
 - 1. During dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

S 14.07 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
 - 1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.
 - 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

S 14.08 INSTALLATION

- C. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
- D. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed, or until dewatering is no longer required.
- E. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
 1. Do not permit open-sump pumping.
- F. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
 1. Maintain piezometric water level a minimum of 24 inches below surface of excavation.
- G. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, filter bags, and other flow-control devices as required by authorities having jurisdiction, including the IWC.
- H. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.
 1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.
- I. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

END OF SECTION S-14

SECTION S-15 EXECUTION REQUIREMENTS

PART 1 - GENERAL

S 15.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.
- B. Construction Layout and As-Builts shall be performed in accordance with the CONNDOT Standard Specifications, latest edition.

S 15.02 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Coordination of Owner-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.
 - 9. As-built Survey

S 15.03 SUBMITTALS

- A. Qualification Data: Professional Land Surveyor licensed in the state of CT.
- B. Certificates: Submit certificate signed by a professional land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Certified Layout and Cut Sheets: Submit two (2) paper copies, signed by professional land surveyor, and one electronic drawing in AutoCADD format, latest version, of the layout plan and cut sheets before earthwork operations begin.
- D. Certified Final As-Built: Submit two (2) paper copies, signed by professional land surveyor, and one electronic drawing in AutoCADD format, latest version, of the final as-built of the entire site after all construction operations are complete.

S 15.04 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

S 15.05 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

S 15.06 PREPARATION

- A. Existing Utility Information: Furnish information to ENGINEER that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to ENGINEER. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

S 15.07 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify ENGINEER promptly. CONTRACTOR will be provided with electronic drawings of the entire project before construction begins. CONTRACTOR will be responsible for utilizing these drawings as he sees fit to create the layout plans as required by the ENGINEER.
- B. General: Engage a professional land surveyor to lay out the Work using accepted surveying practices.
 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 3. Inform installers of lines and levels to which they must comply.
 4. Check the location, level and plumb, of every major element as the Work progresses.

5. Notify ENGINEER when deviations from required lines and levels exceed allowable tolerances.
 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by ENGINEER.

S 15.08 CONSTRUCTION AS-BUILTS

- A. All as-built submissions will be considered shop drawings and will be reviewed by the ENGINEER and returned to the CONTRACTOR within the time frame allowed by the contract documents. Each as-built must be approved by the ENGINEER before the CONTRACTOR can proceed with construction.
- B. Before As-Builts begin, the CONTRACTOR shall verify the benchmark information provided by the ENGINEER and insure the as-builts will be performed in the same coordinate system that was provided by the ENGINEER.
- C. Final As-Builts shall be performed at a 50' x 50' grid across the entire site after all items of construction are complete. In addition to the grid throughout the grass and sod areas, all above ground flatwork shall be located and documented on the plan.

S 15.09 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of ENGINEER. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to ENGINEER before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

S 15.10 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by ENGINEER.
 2. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

S 15.11 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

S 15.12 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, provide water trucks to suppress dust.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

S 15.13 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

S 15.14 PROTECTION OF INSTALLED CONSTRUCTION

- E. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- F. Comply with manufacturer's written instructions for temperature and relative humidity.

S 15.15 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

END OF SECTION S-15

SECTION S-16 HOT MIX ASPHALT PAVING

PART 1 - GENERAL

S 16.01 SUMMARY

- A. This Section includes the following:
 - 1. Hot-mix asphalt paving.
 - 2. Pavement-marking paint.

S 16.02 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract including the General and Supplementary Conditions of this Specification apply to this section.

S 16.03 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the standard specifications of the state or of authorities having jurisdiction.
 - 1. Standard Specification: Connecticut Department of Transportation.
 - 2. Measurement and payment provisions and safety program submittals included in the Connecticut Department of Transportation Standard Specifications do not apply to this Section.

S 16.04 SUBMITTALS

- A. Product Data: For each product specified. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: For each job mix proposed for the Work.
- C. Material Test Reports: Indicate and interpret test results for compliance of materials with requirements indicated.
- D. Material Certificates: Certificates signed by the manufacturers certifying that each material complies with the requirements.

S 16.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.
 - 1. The firm shall be a registered and approved paving mix manufacturer with authorities having jurisdiction or with the Connecticut Department of Transportation.
- C. Testing Agency Qualifications: Demonstrate to the Engineer's satisfaction, based on the evaluation of criteria conforming to ASTM D 3666, that the independent testing agency has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- D. Asphalt-Paving Publication: Comply with AI's "The Asphalt Handbook," except where more stringent requirements are indicated.

S 16.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to the Project site(s) in original packages with the seals unbroken, bearing the manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by the manufacturer. Protect stored materials from direct sunlight.

S 16.07 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
 - 1. Prime and Tack Coats: Minimum surface temperature of 60-degrees F.
 - 2. Asphalt Base Course: Minimum surface temperature of 40-degrees F and rising at time of placement.
 - 3. Asphalt Surface Course: Minimum surface temperature of 60-degrees F at time of placement.

- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40-degrees F for oil-based materials, 50-degrees F for water-based materials, and not exceeding 95-degrees F.

S 16.08 PAYMENT

- A. Payment for pavement restoration shall be as specified under specification Section S-8 – Restoration of Surfaces.

PART 2 - PRODUCTS

S 16.09 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: Sound; angular crushed stone; crushed gravel; or properly cured, crushed blast furnace slag; complying with ASTM D 692.
- C. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone; gravel, properly cured blast-furnace slag, or combinations thereof; complying with ASTM D 1073.
 - 1. For hot-mix asphalt, limit natural sand to a maximum of 20% by weight of the total aggregate mass.
- D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D 242.

S 16.10 ASPHALT MATERIALS

- A. Asphalt Cement: ASTM D 3381 for viscosity-graded material; ASTM D 946 for penetration-graded material.
- B. Prime Coat: Asphalt emulsion prime conforming to CTDOT requirements.
- C. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- D. Water: Potable.

S 16.11 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by Environmental Protection Agency (EPA). Provide granular, liquid, or wettable powder form.
- B. Sand: ASTM D 1073, Grade Nos. 2 or 3.
- C. Paving Geotextile: Nonwoven polypropylene, specifically designed for paving applications, resistant to chemical attack, rot, and mildew.
- D. Pavement-Marking Paint: Alkyd-resin type, ready-mixed, complying with FS TT-P-115, Type I, or AASHTO M-248, Type N.

S 16.12 MIXES

- A. Hot-Mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by NJDOT; designed according to procedures in AI's "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Base Course: As indicated.
 - 3. Surface Course: As indicated.

PART 3 - EXECUTION

S 16.13 EXAMINATION

- A. Verify that the sub grade is dry and in suitable condition to support paving and imposed loads.
- B. Proof-roll sub bases using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Notify the Engineer in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

S 16.14 COLD MILLING

- A. Clean existing paving surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement, including hot-mix asphalt and, as necessary, unbound-aggregate base course, by cold milling to grades and cross sections indicated.
 - 1. Repair or replace curbs, manholes, and other construction damaged during cold milling.

S 16.15 PATCHING AND REPAIRS

- A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Recompact new subgrade. Excavate rectangular or trapezoidal patches. Cut excavation faces vertically.
 - 1. Tack coat faces of excavation and allow curing before paving.
 - 2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
 - 3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
 - 1. Pump hot under sealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to reseal pieces firmly.
 - 2. Remove disintegrated or badly broken pavement. Prepare and patch with hot-mix asphalt.
- D. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than one (1") inch in existing pavements.
 - 1. Install leveling wedges in compacted lifts not exceeding three (3") inches thick.
- E. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of ¼". Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.

- F. Tack Coat: Apply uniformly to existing surfaces of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement.
1. Allow tack coat to cure undisturbed before paving.
 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

S 16.16 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: Apply herbicide according to the manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
1. Mix herbicide with prime coat when formulated by manufacturer for that purpose.
- C. Prime Coat: Apply uniformly over surface of compacted-aggregate base. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 72-hours minimum.
1. If prime coat is not entirely absorbed within 24-hours after application, spread sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 2. Protect primed substrate from damage until ready to receive paving.

S 16.17 PAVING GEOTEXTILE INSTALLATION

- A. Place paving geotextile promptly according to the manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds.

1. Protect paving geotextile from traffic and other damage and place hot-mix asphalt paving overlay the same day.

S 16.18 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt mix on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness, when compacted.
 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 2. Place hot-mix asphalt surface course in single lift.
 3. Place Spread mix at minimum temperature of 250-degrees F.
 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

S 16.19 JOINTS

- A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
 1. Clean contact surfaces and apply tack coat.
 2. Offset longitudinal joints in successive courses a minimum of six (6") inches.
 3. Offset transverse joints in successive courses a minimum of 24-inches.
 4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook."

5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within two (2%) percent of specified course density.

S 16.20 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
 1. Complete compaction before mix temperature cools to 185-degrees F.
- B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and re-rolling to required elevations.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 1. Average Density: 96 percent of reference laboratory density according to ASTM D 1559, but not less than 94 percent nor greater than 100-percent.
 2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90-percent nor greater than 96-percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

S 16.21 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus ½-inch.
 - 2. Surface Course: Plus ¼-inch, no minus.

S 16.22 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with the Engineer.
- B. Allow paving to cure for 30-days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at the manufacturer's recommended rates to provide the minimum wet film thickness.

S 16.23 FIELD QUALITY CONTROL

- A. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- B. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- C. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.
 - 1. Reference laboratory density will be determined by averaging results from four (4) samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 1559, and compacted according to job-mix specifications.

2. Reference maximum theoretical density will be determined by averaging results from four (4) samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
- D. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION S-16

SECTION S-17

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

S 17.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

S 17.02 SUMMARY

- B. This Section includes cast-in-place concrete, including reinforcement, concrete materials, mix design, placement procedures, and finishes.
- C. Omit
- D. All work with the State Right of Way shall be performed in accordance with CONNDOT specifications and material requirements.

S 17.03 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Division 1 Section "Submittals".
 - 1. Manufacturer's literature as needed to supplement certified data.
 - 2. Product Data: For each manufactured material and product indicated.
 - 3. Design Mixes: For each concrete mix indicated.
 - 4. Details of steel reinforcement placement including material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangements, and support.
- B. A copy of the contract mechanical process drawings, with addenda, if applicable, that are applicable to the equipment specified in this section, marked to show all changes necessary for the equipment proposed for this specification section. If no changes are required, mark all drawings with "No changes required" or provide a statement that no changes are required.
 - 1. Failure to include all drawings or a statement applicable to the equipment specified in this section will result in submittal return without review until a complete package is submitted.
 - 2. A copy of this specification section and all referenced specification sections, with each paragraph check-marked to indicate specification. If deviations and

- clarifications from the specifications are indicated, therefore requested by the Contractor, provide a detailed written justification for each deviation and clarification.
3. Failure to include a copy of the marked-up specification sections and or the detailed justifications for any requested deviation or clarification will result in submittal return without review until marked up specifications and justifications are submitted in a complete package.

S 17.04 QUALITY ASSURANCE

- A. Provide in accordance with Division 1 Section "Quality Assurance" and as specified herein.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Comply with ACI 301, "Specification for Structural Concrete," including the following, unless modified by the requirements of the Contract Documents.
 1. General requirements, including submittals, quality assurance, acceptance of structure, and protection of in-place concrete.
 2. Formwork and form accessories.
 3. Steel reinforcement and supports.
 4. Concrete mixtures.
 5. Handling, placing, and constructing concrete.

S 17.05 SPECIAL REQUIREMENTS

- A. Refer to applicable specification sections with regard to providing the following:
 1. Foundations, Installations and Grouting as specified in Division 1 Section "Material and Equipment."
 2. Special Tools as specified in Division 1 Section "Material and Equipment."
 3. Bolts, Anchor Bolts, and Nuts as specified in Division 1 Section "Material and Equipment."
 4. Sleeves and Inserts as specified in Division 1 Section "Material and Equipment."

PART 2 - PRODUCTS

S 17.06 MATERIALS

- A. Formwork: Furnish formwork and form accessories according to ACI 301.

B. Steel Reinforcement:

1. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed.
2. Plain-Steel Wire: ASTM A 82, as drawn.

C. Concrete Materials:

1. Portland Cement: ASTM C 150, Type II.
2. Normal-Weight Aggregate: ASTM C 33, uniformly graded, not exceeding 1-1/2-inch nominal size.
3. Water: Complying with ASTM C 94.

D. Admixtures:

1. Air-Entraining Admixture: ASTM C 260.
2. Water-Reducing Admixture: ASTM C 494, Type A.
3. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
4. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
5. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

E. Curing Materials:

1. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

S 17.07 CONCRETE MIXES

A. Comply with ACI 301 requirements for concrete mixtures.

B. Prepare design mixes, proportioned according to ACI 301, for normal-weight concrete determined by either laboratory trial mix or field test data bases, as follows:

1. Compressive Strength (28 Days): 4000 psi.
2. Slump: 4 inches.
 - a. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than 8 inches after adding admixture to plant- or site-verified, 2- to 3-inch slump.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 6.0 percent within a tolerance of plus 1.0 or minus 1.5 percent.

S 17.08 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with ASTM C 94
 - 1. When air temperature is between 85 and 90 deg F reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F reduce mixing and delivery time to 60 minutes.
- B. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

S 17.09 INSTALLATION, GENERAL

- A. Formwork: Design, construct, erect, shore, brace, and maintain formwork according to ACI 301.
- B. Steel Reinforcement: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- C. Joints: Construct joints true to line with faces perpendicular to surface plane of concrete.
 - 1. Construction Joints: Locate and install so as not to impair strength or appearance of concrete, at locations indicated or as approved by Architect.
 - 2. Isolation Joints: Install joint-filler strips at junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - a. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
- D. Tolerances: Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

S 17.10 CONCRETE PLACEMENT

- A. Comply with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- B. Do not add water to concrete during delivery, at Project site, or during placement.
- C. Consolidate concrete with mechanical vibrating equipment.

S 17.11 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Completely remove fins and other projections.
 - 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
 - 2. Do not apply rubbed finish to smooth-formed finish.
 - 3. Apply smooth-rubbed finish, defined in ACI 301, to smooth-formed finished concrete.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

S 17.12 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on the surface.
 - 1. Do not further disturb surfaces before starting finishing operations.
- C. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

- E. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- F. Nonslip Broom Finish: Apply a nonslip broom finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

S 17.13 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection, and follow recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions occur before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- D. Cure formed and unformed concrete for at least seven days as follows:
 - 1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

S 17.14 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Tests will be performed according to ACI 301.

Testing Frequency: One composite sample for each day's pour of each concrete mix exceeding 5 cu. yd. but less than 25 cu. yd. plus one set for each additional 50 cu. yd. or fraction thereof.

END OF SECTION S-17

SECTION S-18 PRECAST CONCRETE STRUCTURES

PART 1 - GENERAL

S 18.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract apply to this Section.

S 18.02 SUMMARY

- A. Provide precast concrete structures for precast concrete wet well and valve chamber.
- B. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Section S-20 "Access Doors"

S 18.03 REFERENCES

- A. American Society for Testing and Materials (ASTM) Publications. The latest version at the time of bid shall apply:
 - 1. A36: Specification for Structural Steel.
 - 2. A48: Specification for Gray Iron Castings.
 - 3. A185: Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - 4. A322: Specification for Carbon and Alloy Steel Bars.
 - 5. A536: Specification for Ductile Iron Castings.
 - 6. A615: Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 7. A743: Specification for Castings, Iron-Chromium, Iron-Chromium Nickel, and Nickel-Base Corrosion-Resistant for General Application.
 - 8. B584: Specification for Copper Alloy Sand Castings for General Applications.
 - 9. C33: Specification for Concrete Aggregates.
 - 10. C150: Specification for Portland Cement.

S 18.04 SYSTEM RESPONSIBILITY

- A. Precast concrete structures shall be as specified and indicated and as shown on the Contract Drawings.
- B. The precast concrete structures manufacturer shall be responsible for coordinating the installation of all access hatches and ladder rungs as specified and indicated and as shown on the Contract Drawings.

- C. The dimensions of the precast wet well concrete structure shall be confirmed with the equipment manufacturer to ensure that the required clearances are established for equipment installation.

S 18.05 SEISMIC DESIGN REQUIREMENTS

- A. The Contractor shall conform to the seismic design requirements for this project and for the work of this specification section.
- B. Provide all equipment bases, anchorage, supports and foundations designed in accordance with the seismic requirements indicated and specified.
- C. Additionally, provide with the Certificate of Unit Responsibility, certification for all equipment signed by a registered structural engineer stating that computations were performed and that all components have been sized for the seismic forces specified and indicated.

S 18.06 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with the General Conditions.
 - 1. Certified shop and erection drawings.
 - 2. Shop drawing data for accessory items.
 - 3. Certified setting plans, with tolerances, for anchor bolts.
 - 4. Manufacturer's literature as needed to supplement certified data.
 - 5. Listing of reference installations as specified with contact names and telephone numbers.
 - 6. Shop and field inspection reports.
 - 7. Recommendations for short and long-term storage.
 - 8. Design calculations and shop drawings signed and sealed by a Connecticut Professional Engineer.
 - 9. Manufacturer's product data and specifications for painting.
 - 10. Provide a scaled drawing for each precast concrete structure.
 - 11. Product Data: For each manufactured material and product indicated.
 - 12. Design Mixes: For each concrete mix indicated.
 - 13. Details of steel reinforcement placement including material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangements, and support.
 - 14. Material Certification:
 - a. Provide certification from the equipment manufacturer that the materials of construction specified are recommended and suitable for the service conditions specified and indicated. If materials other than those specified are proposed based on incompatibility with the service conditions, provide technical data and certification that the proposed materials are recommended and suitable for the service conditions specified and indicated including an installation list of a minimum of five (5) installations

in operation for a minimum of five (5) years. Provide proposed materials at no additional cost to the Owner.

- b. Where materials are not specified, provide technical data and certification that the proposed materials are recommended and suitable for the service conditions specified and indicated.

- B. Certificate of Unit Responsibility.

S 18.07 QUALITY ASSURANCE

- A. Provide in accordance with the General Conditions and as specified herein.
- B. Precast concrete structures shall be the product of one manufacturer.
- C. If equipment proposed is heavier or taller, different rotation, or discharge arrangement than specified and indicated; provide all structural, architectural and mechanical revisions at no additional cost to the Owner.

S 18.08 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Division 1 Section "Delivery, Storage and Handling" and as specified herein.
- B. Shipping:
 1. Ship equipment and material complete except where partial disassembly is required by transportation regulations or for protection of components.
- C. Receiving
 1. Inspect and inventory items upon delivery to site.
 2. Store and safeguard equipment, material and spare parts in accordance with manufacturer's written recommendations and instructions.

PART 2 - PRODUCTS

S 18.09 MANUFACTURERS

- A. Precast Concrete Structures:
 1. Atlantic Precast Corp.
 2. Or approved equal.

S 18.10 PREFABRICATED CONCRETE STRUCTURES

- A. General:

1. Provide prefabricated concrete structures for the wet well and valve vault as specified and indicated.
2. Prefabricated concrete structures shall be constructed to the general lengths, diameters, widths, and heights as shown on the Contract Drawings.
3. Special attention shall be given to equipment clearances and/or control dimensions noted on the Contract Drawings and/or as specified and indicated.
4. The structures shall be designed to adequately and safely support all live and dead loads to which the structure will be subjected, and to withstand all conditions which may be encountered.
5. Design calculations shall verify that the structures have been designed to withstand the burial depth, groundwater hydrostatic pressures and seismic forces based on the information provided, and also the dead and live loads anticipated for the structure.
 - a. Structures shall have adequate wall, floor, and roof thickness and steel reinforcement for the depth and conditions of burial as shown of the Contract Drawings.
 - b. Design computations for uplift forces shall contain a minimum factor of safety of 1.25.
6. Structures shall be cast with a monolithic extended base slab.
 - a. Cast in place or secondary pour base slabs will not be accepted.
7. All pipe wall penetrations shall be formed using Z-Lok Cast-In Boots in accordance with the manufacturer's recommendations.
8. Each precast module shall be provided with formed male and female joints formed entirely of concrete employing a round rubber gasket in accordance with ASTM-361.
 - a. Connection shall be self centering and watertight upon assembly. All joints shall be mortared inside and outside.
9. Wet well and valve chamber structures shall be fabricated and cast at the prefabricated concrete structure supplier's facility in full accordance with approved structural designs and shop drawings.
 - a. The facility shall be of sufficient size to permit concrete casting and assembly of all structural components within an environmentally controlled building.
 - b. All work associated with casting, fabricating, assembling and testing of the structures shall be performed within the building.
 - c. Building shall keep the structures protected from the elements and be maintained at an ambient temperature of at least 45° F.
 - d. No concrete shall be poured when the ambient temperature in the building is less than 50° F.

B. Concrete:

1. Concrete used in the manufacture of the various structural components of the precast concrete structures shall meet the following requirements:
 - a. Cement shall be High Early Strength Portland Cement, Type III, conforming to ASTM C-150.
 - b. Fine aggregate shall consist of washed natural sand.
 - c. Air entrainment shall be 4.5% plus or minus 1%.
 - d. A super-plasticizer may be used and if so, concrete shall be placed at a slump of 6" plus or minus 1- ½".
 - e. Concrete used for the structural components shall attain a minimum 7-day compressive strength of 5,000 psi.
 - f. Fillets in Wet Well and Valve Chamber, as shown on the drawings, shall be cast monolithically. Cast in place or secondary pour fillets will not be acceptable.
 - g. Concrete supplier shall have on staff a Certified Technician who shall conduct in-house concrete strength tests, as specified herein, taken from the same concrete batch used on the actual components of the structures. Test results shall be recorded and shall be submitted to the Engineer.
 - 1) As a minimum, six concrete test cylinders shall be made for each production day. Two cylinders shall be tested at time of product stripping, two at seven days cured in environment similar to the actual component, and two at 28 days cured in 100% humidity. Results shall be furnished to the Engineer.
 - h. Two (2) coats of a bitumastic coating as manufactured by Sherwin Williams, or approved equal shall be applied to the exterior surfaces of the chambers.
 - i. Two (2) coats of CoreCote SC, as manufactured by Sherwin Williams, or approved equal shall be applied to the entire interior surface of the wet well.
 - j. Three (3) coats of a epoxy paint system as manufactured by Sherwin Williams shall be applied to the interior of the valve chamber.
 - k. Reinforcing steel used in the manufacture of the various structural components of the precast concrete components shall meet the following requirements:
 - 1) Steel shall be new, epoxy coated billet steel, deformed steel bars conforming to ASTM A-615 (latest revision) Grade 60.
 - 2) Welded steel wire fabric reinforcing shall conform to ASTM A-185 (latest revision).
 - 3) Minimum cover of reinforcement shall be one inch.

S 18.11 ACCESS DOORS

- A. Provide access doors for the chamber in accordance with Division 8 Section "Access Doors" and as specified and indicated and as shown on the Contract Drawings.

S 18.12 LADDERS

- A. Provide ladders for valve chamber as specified and indicated and as shown on the Contract Drawings.
- B. Ladder shall be Series L1B with Series L1E ladder extension as manufactured by Halliday Products, or approved equal.
 - 1. Ladders shall be constructed entirely of aluminum.
 - 2. Rail shall be 3/8" x 2 1/2" flat bar and shall be spaced 16" apart.
 - 3. Wall mounted standoffs shall be 3/8" x 2 1/2" flat bar and welded to the rails at a maximum of 60" on center.
 - a. Standoffs shall be a minimum of 7" and manufactured to fit flush with the wall.
 - 4. 1 3/8" diameter slip resistant ribbed rungs shall be spaced 12" on center and shall be welded to the inside of each rail.
 - 5. Provide safety extension for each ladder as specified and indicated:
 - a. 1 5/8" diameter aluminum safety post with Stainless Steel pin to secure safety post in fully extended position.
 - b. 2" x 2" aluminum tube housing safety post with "T" shaped slot to accept pin of safety post to secure safety post in fully extended position.
 - c. Stainless Steel channel clamps and 3/8" Stainless Steel U-bolts shall secure tube to ladder.
 - d. Provide black cap for top of safety post

PART 3 - EXECUTION

S 18.13 INSTALLATION

- A. Install items in accordance with manufacturer's printed instructions, as indicated and specified.

S 18.14 FIELD TOUCH-UP PAINTING

- A. After installation and approved by the Engineer. Contractor shall apply touch-up paint to all scratched, abraded and damaged shop painted surfaces. Coating type and color shall match shop painting.

S 18.15 PROJECT CLOSEOUT

- A. Provide in accordance with the General Conditions

END SECTION S-18

SECTION S-19 GROUT

PART 1 - GENERAL

S 19.01 REQUIREMENTS

- A. Furnish all materials, labor, and equipment required to provide all grout used in concrete work and as bearing surfaces, in accordance with the Contract Documents.

S 19.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Requirements of related work are included in Division 1 and Division 2 of these Specifications.

S 19.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of the Bid.
 1. CRD-C 621 Corps of Engineers Specifications for Non-Shrink Grout
 2. ASTM C 109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch or cube Specimens)
 3. ASTM C 531 Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts and Monolithic Surfacing
 4. ASTM C 579 Test Method for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacing
 5. ASTM C 827 Standard Test Method for Early Volume Change of Cementitious Mixtures
 6. ASTM C 144 Standard Specification for Aggregate for Masonry Mortar
 7. ASTM C 1107 Standard Specification for Packaged Dry, Hydraulic Cement Grout (Non-shrink)

S 19.04 SUBMITTALS

- A. Submit the following:
 1. Certified test results verifying the compressive strength and shrinkage and expansion requirements specified herein.
 2. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement and appropriate uses for each type of grout used in the work.

S 19.05 QUALITY ASSURANCE

A. Field Tests

1. Compression test specimens will be taken during construction from the first placement of each type of grout and at intervals thereafter as selected by the Engineer to insure continued compliance with these Specifications. The specimens will be made by the Engineer or its representative.
 - a. Compression tests and fabrication of specimens for cement grout and non-shrink grout will be performed as specified in ASTM C 109 at intervals during construction as selected by the Engineer. A set of three (3) specimens will be made for testing at seven (7) days, 28 days and any additional time period as appropriate.
 - b. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C 579, Method B, at intervals during construction as selected by the Engineer. A set of three (3) specimens will be made for testing at seven (7) days and any other time period as appropriate.
2. The cost of all laboratory tests on grout will be borne by the Contractor. If additional tests and investigation is necessary because the results are not in accordance with the Specifications then the Contractor shall be responsible for the additional costs to provide the additional testing and investigation. The Contractor shall supply all materials necessary for fabricating the test specimens, at no additional cost to the Owner.
3. All grout, already placed, which fails to meet the requirements of these Specifications, is subject to removal and replacement at no additional cost to the Owner.

PART 2 - PRODUCTS

S 19.06 MATERIALS

A. Cement grout

1. Cement grout shall be composed of Portland Cement and sand in the proportion specified in the Contract Documents and the minimum amount of water necessary to obtain the desired consistency. If no proportion is indicated, cement grout shall consist of one (1) part Portland Cement to three (3) parts sand. Water amount shall be as required to achieve desired consistency without compromising strength requirements. White portland cement shall be mixed with the Portland Cement as required to match the color of adjacent concrete.
2. The minimum compressive strength at 28 days shall be 4000 psi.
3. For beds thicker than 1 ½" inch and/or where free passage of grout will not be obstructed by coarse aggregate, 1 ½ parts of coarse aggregate having a top size of 3/8" should be added.
4. Sand shall conform to the requirements of ASTM C144.

B. Non-Shrink Grout

1. Non-shrink grout shall conform to CRD-C 621 and ASTM C 1107, Grade B or C when tested at a maximum fluid consistency of 30 seconds per CDC 611/ASTM

C939 at temperature extremes of 45°F and 90°F and an extended working time of 15 minutes. Grout shall have a minimum 28-day strength of 7,000 psi. Non-shrink grout shall be, "Euco N-S" by the Euclid Chemical Company, "Sikagrout 212" by Sika Corporation, Conspec 100 Non-Shrink Non-Metallic Grout by Conspec, Masterflow 555 Grout by BASF Construction Chemicals or equal.

C. Epoxy Grout

1. Epoxy grout shall be "Sikadur 32 Hi-Mod" by Sika Corporation, "Duralcrete LV" by Tamms Industries, or "Euco #452 Series" by Euclid Chemical, Concsive 1090 by BASF Construction Chemicals or equal.
2. Epoxy grout shall be modified as required for each particular application with aggregate per manufacturer's instructions.

S 19.07 CURING MATERIALS

- A. Curing materials shall be as specified in Section S-17 - Cast in Place Concrete for cement grout and as recommended by the manufacturer for prepackaged grouts.

PART 3 - EXECUTION

S 19.08 GENERAL

- A. The different types of grout shall be used for the applications stated below unless noted otherwise in the Contract Documents. Where grout is called for in the Contract Documents which does not fall under any of the applications stated below, non-shrink grout shall be used unless another type is specifically referenced.
1. Cement grout shall be used for grout toppings and for patching of fresh concrete.
 2. Non-shrink grout shall be used for grouting beneath base plates of structural metal framing.
 3. Epoxy grout shall be used for bonding new concrete to hardened concrete.
- B. New concrete surfaces to receive cement grout shall be as specified in Section S-17 - Cast in Place Concrete, and shall be cleaned of all dirt, grease and oil-like films. Existing concrete surfaces shall likewise be cleaned of all similar contamination and debris, including chipping or roughening the surface if a laitance or poor concrete is evident. The finish of the grout surface shall match that of the adjacent concrete. Curing and protection of cement grout shall be as specified in Section S-17 - Cast in Place Concrete.
- C. All mixing, surface preparation, handling, placing, consolidation, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.
- D. The Contractor, through the manufacturer of a non-shrink grout and epoxy grout, shall provide on-site technical assistance upon request, at no additional cost to the Owner.

S 19.09 CONSISTENCY

- A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is such that the grout is plastic and moldable but will not flow.

S 19.10 MEASUREMENT OF INGREDIENTS

- A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement shall not be allowed.
- B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

S 19.11 GROUT INSTALLATION

- A. Grout shall be placed quickly and continuously, shall completely fill the space to be grouted and be thoroughly compacted and free of air pockets. The grout may be poured in place, pressure grouted by gravity, or pumped. The use of pneumatic pressure or dry-packed grouting requires approval of the Engineer. For grouting beneath base plates, grout shall be poured from one side only and thence flow across to the open side to avoid air-entrapment.

END SECTION S-19

SECTION S-20 ACCESS DOORS

PART 1 - GENERAL

S 20.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract apply to this Section.

S 20.02 SUMMARY

- A. This Section includes the following types of access doors:
 - 1. Precast Concrete Chamber access doors.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section S-18 "Precast Concrete Structures".

S 20.03 DESCRIPTION

- A. Provide access doors as specified and required by the Contract Drawings.
- B. Access doors shall be provided in accordance with the Access Door Schedule included in Section 20.11 of this Specification.
- C. Capacities are as specified and indicated.

S 20.04 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with the General Conditions.
 - 1. Submit shop drawing data for accessory items.
 - 2. Manufacturer's literature as needed to supplement certified data.
 - 3. List of references installations as specified with contact names and telephone numbers.
 - 4. Submit recommendations for short and long-term storage.
 - 5. Special tools.
 - 6. Material certification from other specifications.
- B. Product data for each type of access door assembly specified, including details of construction relative to materials, individual components, profiles, finishes, and fire-protection ratings (if required).
 - 1. The Contractor shall include in the Work, and submit, a complete schedule, including types, general locations, sizes, wall and ceiling construction details, latching or locking provisions, and other data pertinent to installation, for all access doors required.

2. All access doors required, are to be provided as part of the Work, and shall be the responsibility of the General Contractor to coordinate with the precast concrete manufacturer as to the location and requirements of installation.

S 20.05 QUALITY ASSURANCE

- A. Provide in accordance with the General Conditions and as specified herein.
- B. Single-Source Responsibility: Obtain access doors for entire Project from one (1) source and by a single manufacturer.
- C. Size Variations: Obtain Engineer's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.

S 20.06 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with the General Conditions and as specified.
- B. Shipping:
 1. Ship products and material complete except where partial disassembly is required by transportation regulations or for protection of components.
- C. Receiving:
 1. Inspect and inventory items upon delivery to site.
 2. Store and safeguard products and material in accordance with manufacturer's written instructions.
- D. Verification: The Contractor shall coordinate with all sub-contractors and supply access doors as part of the Work. Specific locations and sizes for access doors needed to gain access to concealed equipment required by each trade shall be the responsibility of the Contractor to coordinate and indicate on the required schedule. Access doors required to have access to other doors, fire shutters, plumbing devices etc., shall be part of the Work, and the responsibility of the Contractor to provide if the respective sub-contractor does not.

PART 2 - PRODUCTS

S 20.07 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 1. Halliday Products
 2. Or approved equal.

S 20.08 ANGLE FRAME ACCESS HATCH

- A. Access doors specified to have an angle frame shall meet the following requirements.
 - 1. Cover leaf shall be ¼" aluminum diamond plate.
 - 2. Angle frame shall be ¼" aluminum with continuous anchor flange.
 - 3. Load Rating shall be H-20 uniform live load with a maximum allowable deflection of 1/150 of the span.
 - 4. Locking system shall be type 316 stainless steel slam lock with removable key.
 - 5. Cover shall be equipped with stainless steel spring assists, T-316 heavy duty hinges, T-316 heavy duty hinges, T-316 tamper proof attaching hardware, automatic, and T-316 hold open arm with aluminum latch.
 - 6. Access covers shall carry a lifetime guarantee against defects in material and/or workmanship.

S 20.09 CHANNEL FRAME ACCESS DOORS

- A. Access doors specified to have a channel frame shall meet the following requirements:
 - 1. Cover leaf shall be ¼" aluminum diamond plate and shall not protrude into the frame when the cover is in the open position.
 - 2. The channel frame shall be ¼" aluminum with continuous anchor flange and a 1 ½" drainage coupling located in the front left corner of the frame.
 - 3. The load rating shall be H-20 uniform live load with a maximum allowable deflection of 1/150 of the span.
 - 4. Locking system shall be stainless steel slam lock with removable key.
 - 5. Cover shall be equipped with stainless steel spring assists, T-316 heavy duty hinges, T-316 tamper proof attaching hardware, automatic T-316 hold open arm with aluminum latch.
 - 6. Access covers shall carry a lifetime guarantee against defects in material and/or workmanship.

S 20.10 FALL THROUGH PROTECTION

- A. Fall through protection shall be provided for each access door as specified.
- B. The protective grating panel shall be 3 inch (76mm) aluminum "I" bar grating with Safety Orange powder-coated finish. Grating shall be hinged with tamper proof stainless steel bolts, and shall be supplied with a positive latch to maintain unit in an upright position. Grating shall have a 6-in. (152mm) viewing area on each lateral unhinged side for visual observation and limited maintenance. A padlock hasp for owner-supplied padlock shall be provided execution.
- C. Fall through protection shall be as provided by Halliday Products or approved equal.

S 20.11 FABRICATION

- A. General: Manufacture each access door assembly as an integral unit ready for installation.
- B. See Access Door Schedule Below:

LOCATION	MATERIAL	CLEAR OPENING SIZE	REMARKS
Pump Station Wet Well	Aluminum	30" X 30"	H2O Loading, Single Leaf, Angle Frame

S 20.12 PREPARATION

- D. Advise Installers of other work about specific requirements relating to access door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices. Furnish inserts and anchoring devices for access doors that must be built into other construction. Coordinate delivery with other work to avoid delay.

S 20.13 INSTALLATION

- A. Comply with manufacturer's instructions for installing access doors.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finished surfaces.
- C. Install concealed-frame access doors flush with adjacent finish surfaces.

S 20.14 ADJUST AND CLEAN

- A. Adjust hardware and panels after installation for proper operation.
- B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

S 20.15 PROJECT CLOSEOUT

- A. Provide in accordance with the General Conditions.

END SECTION S-20

SECTION S-21 SHOP PAINTING

PART 1 - GENERAL

S 21.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract apply to this Section.

S 21.02 SUMMARY

- B. Provide labor, materials, equipment and incidentals required for the surface preparation and application of shop primers on ferrous metals, excluding stainless steels, as specified herein.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 9, Section 22 "Field Painting."
 - 2. Factory prefinished items as specified.

S 21.03 REFERENCES

- D. Steel Structures Painting Council (SSPC) Specifications:
 - 1. SSPC-PA 1: Shop, Field, and Maintenance Painting.
 - 2. SSPC-PA-2: Measurement of Dry Paint Thickness with Magnetic Gages.
 - 3. SSPC-SP 1: Solvent Cleaning.
 - 4. SSPC-SP 3: Power Tool Cleaning.
 - 5. SSPC-SP 6: Commercial Blast Cleaning.
 - 6. SSPC-SP10: Near-White Blast Cleaning.

S 21.04 SUBMITTALS

- E. Shop Drawings: Submit the following in accordance with Division 1 Section "Submittals":
 - 1. Manufacturer's specifications and data on the proposed primers and detailed surface preparation, application procedures and dry mil thicknesses, including list of items and surfaces to receive shop painting.

S 21.05 DELIVERY, STORAGE AND HANDLING

- F. Provide in accordance with general provisions of the specifications and as specified herein.

- G. Deliver materials to application area in original, unbroken containers, plainly marked with name and analysis of product, manufacturer's name, and shelf life date. Do not store or use contaminated, outdated, prematurely opened, or diluted materials.
- H. Store coated items to prevent damage or dirtying of coatings. Avoid need for special cleaning, and store coated items out of contact with ground or pavement. Place suitable blocking under coated items during storage.
- I. Do not expose surfaces to weather for more than six months before being topcoated, or less time if recommended by coating manufacturer.
- J. Protect surfaces not to receive paint coatings during surface preparation, cleaning, and painting.
- K. Protect coatings from damage during shipment and handling by padding, blocking, use canvas or nylon slings, and use care when handling.
- L. At time of delivery of shop painted items to job site, ensure coatings are undamaged and in good condition.

S 21.06 JOB CONDITIONS

- M. Environmental Requirements:
 - 1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.
 - 2. Do not apply coatings when dust is being generated.

PART 2 - PRODUCTS

S 21.07 MATERIALS

- A. Coatings are divided into the following two types, as determined by service conditions:
 - 1. Type S Service (Submerged Surfaces): Shop primer for ferrous metals which will be submerged or which are subject to splash action or which are specified to be considered submerged service. Spray one coat with a dry film thickness of 3.5 to 4.5 mils with one of the following:
 - a. Tnemec 66 Boston Gray Primer made by Tnemec Co., North Kansas City, MO.
 - b. Dupont 25P Epoxy Primer made by Dupont, Wilmington, DE.
 - c. Valspar 13-R-60 Epoxy Metal Primer made by Valspar Corp., Short Hills, NJ.

2. Type E Service (Non-Submerged Surfaces - Interior and Exterior): Spray one coat with a dry film thickness of 3.0 to 4.0 mils with one of the following:
 - a. Tnemec 66 Boston Gray Primer made by Tnemec Co., North Kansas City, MO.
 - b. Dupont 25P made by Dupont, Wilmington, DE.
 - c. Valspar 13-R-60 Epoxy Metal Primer made by Valspar Corp., Short Hills, NJ.
 - d. Or approved equal.
- B. Shop prime with primers guaranteed by the manufacturer to be compatible with their corresponding primers and finish coats specified for use in the field and which are recommended for use together.

PART 3 - EXECUTION

S 21.08 APPLICATION

- A. Surface Preparation and Priming:
 1. Sandblast clean in accordance with SSPC-SP-6, Commercial Grade, immediately prior to priming non-submerged components scheduled for priming, as defined above.
 2. Sandblast clean in accordance with SSPC-SP-10, Near White, immediately prior to priming submerged components scheduled for priming, as defined above.
 3. Before priming, provide surfaces dry and free of dust, oil, grease and other foreign material.
 4. Shop prime in accordance with approved manufacturer's printed recommendations.
- B. Non-primed Surfaces: Apply approved coating in accordance with manufacturer's printed recommendation.

S 21.09 TOUCH-UP

- C. Repair or replace damaged or defective coated areas. Resultant shop painting: Paint items as specified.
- D. Remove damaged or defective coatings by specified blast cleaning to meet surface cleaning requirements, just before recoating. When small areas of coating need touch up, surface preparation may be done with suitable power needle gun to match specified blast cleaning.

END OF SECTION S-21

SECTION S-22 FIELD PAINTING

PART 1 - GENERAL

S 22.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract apply to this Section.

S 22.02 SUMMARY

- A. Provide and apply paints and coatings specified and indicated. Prepare, clean, and finish all surfaces to be field painted as specified and indicated.
 - 1. The terms "paint" and "coating" used herein include emulsions, enamels, paints, stains, varnishes, sealers, and other coatings, organic or inorganic, whether used as intermediate, or finish coats.
 - 2. Stainless steel piping, fittings and supports will not be field painted.
 - 3. Mechanical equipment shall be shop painted as indicated in the technical specifications. The only field painting of shop painted mechanical equipment shall be for touch-up purposes only.
- B. Complete painting and test patches in accordance with specifications, paint manufacturer's current surface preparation and application instructions and safety requirements. In the event of conflict, the more stringent specifications will apply.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 9, Section 22 "Shop Painting."

S 22.03 REFERENCES

- A. Steel Structures Painting Council (SSPC) Specifications:
 - 1. SSPC-PA 1: Shop, Field, and Maintenance Painting.
 - 2. SSPC-PA-2: Measurement of Dry Paint Thickness with Magnetic Gages.
 - 3. SSPC-SP 1: Solvent Cleaning.
 - 4. SSPC-SP 3: Power Tool Cleaning.
 - 5. SSPC-SP 6: Commercial Blast Cleaning.
 - 6. SSPC-SP10: Near-White Blast Cleaning.
- B. American National Standards Institute (ANSI):

1. A13.1: Scheme for the Identification of Piping Systems, Designation.

S 22.04 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

S 22.05 QUALITY ASSURANCE

- A. Provide in accordance with these specifications.
- B. Use products of one manufacturer in any one paint coating system with compatible coating materials. Provide same coating product for touch-up as for original coating.
- C. Do not use or retain contaminated, outdated, or diluted materials for painting. Do not use materials from previously opened containers.
- D. Provide materials having equal quality of products of manufacturers listed herein.
- E. Provide paint products having a minimum of five (5) years of documented service, with no peeling, flaking, chipping, blistering, or fading, under similar service conditions.

S 22.06 SUBMITTALS

- A. Submit the following in accordance with the Bordentown Sewerage Authority Rules and Regulations and as specified herein.
 1. List of coating products (Paint Schedule) with brand, type and manufacturer including dry film thickness and volatile organic compound (V.O.C.) regulations conforming to these specifications.

2. Manufacturer's current printed recommendations and product data sheets for each including performance criteria, surface preparation and applications, instructions and safety requirements.
3. Product data and pertinent information (test patches also) indicating compatibility of field applied coatings with shop applied primers including a schedule listing each primer with field applied coatings to be applied over the primer.
4. Color chip samples of materials proposed and matching color of coatings indicated in Finish Schedule.
5. Color chip samples matching colors indicated in Piping Identification Schedule, attached to this specification. Submit list of piping to be included under each color.
6. Submit manufacturer's published data showing service record specified in paragraph 1.4 E.
7. Submit letter(s), signed by Contractor, stating that surfaces to be coated are ready for preparation as specified in Part-3.
8. Product data for mill thickness testing equipment including operating instructions.
9. Approved mil thickness test results, including location, and surface or item for identification.
10. Submit letter(s) signed by painting subcontractor, certifying that surfaces to be coated have been prepared in accordance with paint manufacturer's printed instructions and are ready for field paint application.
11. Submit letter(s) signed by paint manufacturer certifying that submitted products are suitable for application on the surfaces to be coated and for the service conditions.
12. Submit a Certificate of Compliance for coatings submerged in potable water with National Sanitation Foundation approval.)

S 22.07 PAINT STORAGE AND MIXING AREAS, AND WASTE DISPOSAL

- A. Store paints and painter's materials only in area or areas designated by the Engineer solely for this purpose. Confine mixing, thinning, clean-up and associated operations, and storage of painting debris before authorized disposal, to these areas.
- B. Do not use plumbing fixtures, piping or mechanical equipment for mixing or disposal of paint materials.
 1. Transport water to paint area by temporary hose or piping.
 2. Store waste temporarily in closed, nonflammable containers until final disposal. Keep no rubbish in painter's area longer than 24 hours. Dispose any hazardous materials in accordance with local codes, and place all non-hazardous waste in the central trash trailer area.

S 22.08 DELIVERY, STORAGE, AND HANDLING

- A. General Contractor shall provide storage and protection as specified herein.
- B. Deliver materials to painter's area in original, unbroken, containers with name and analysis of product, manufacturer's name, and shelf life date. Do not use or retain contaminated, outdated, prematurely opened, or diluted materials.
- C. Store coated items and protect coating from damage and foreign matter, by not allowing contact with soil or pavement, exposure to wind-blown particles, or other harmful contacts which necessitate special cleaning. Use blocking during storage.
- D. Do not expose primed surfaces to weather for more than six months before top coating. Allow less open time if recommended by coating manufacturer.
- E. Protect coated items, whether prime or finish, from damage due to shipping and handling. For items with type E or S service coatings; use padding, blocking, fabric slings.

S 22.09 JOB CONDITIONS

- A. Environmental Requirements:
 - 1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.
 - 2. Do not apply coatings when dust is being generated.
- B. Protection:
 - 1. Cover or otherwise protect finish work of other trades and surfaces not being painted concurrently or not to be painted.
 - 2. Do not paint over nameplates, tagging or other identification devices.

PART 2 - PRODUCTS

S 22.10 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to the following:
 - 1. Tnemec Co., Inc.
 - 2. Ameron Protective Coating Systems.
 - 3. Carboline.
 - 4. Benjamin Moore & Co.

5. M.A.B. Paints.
6. PPG Architectural Finishes, Inc.
7. Sherwin-Williams Company (The).

S 22.11 MATERIALS – GENERAL

- A. Paint Coatings: Recommended by their manufacturer for intended service. Use coatings on ferrous surfaces for Type S or Type E service of protective paint coating quality. Service types specified in the following:
 1. Division 9 Section "Shop Painting."
 2. Division 15 Sections
- B. All colors to be selected by the Brookfield Water Pollution Control Facility from full range of available colors for each product.

S 22.12 INTERIOR CONCRETE MASONRY UNITS AND GALVANIZED METAL

- A. BLOCK FILLERS
 1. Block Filler, Latex, Interior/Exterior: MPI #4.
 - a. Benjamin Moore; Moorcraft; Supercraft latex block filler.
 - b. MAB Paints; Block Kote #1000; 100% Acrylic Sprayable block filler.
- B. WATER-BASED PAINTS
 1. Latex, Interior, (Gloss Level 3): MPI #52.
 - a. Benjamin Moore; ECO Spec WB; interior latex eggshell.
 - b. PPG; Speedhide Interior Satin Latex
 - c. Or approved equal.
 2. Light Industrial Coating, Interior, Water Based, Semi-Gloss (Gloss Level 5): MPI #153.
 - a. Benjamin Moore; Super Spec HP; DTM Acrylic Semi-gloss.
 - b. PPG Int./Ext. Semi-gloss Acrylic Metal Finish.
 - c. Sherwin Williams, ProMar 200, interior latex semi-gloss

S 22.13 BITUMASTIC COATING

- A. All areas of aluminum in contact with concrete shall receive a bitumastic coating such as 300M coal tar epoxy as manufactured Carboline.
- B. The coating shall be applied in accordance with the manufacturer's recommendations.

S 22.14 COATING TYPES

- A. Coatings are described in the COATING IDENTIFICATION SCHEDULE by generic type, minimum solids by volume, minimum dry film thickness and abbreviations used in the PAINT SCHEDULE. Provide coatings that comply with the volatile organic compounds (VOC) regulations applicable to the project site and in no case to exceed 3.5 lbs/gal.
- B. COATING IDENTIFICATION SCHEDULE

ABBR.	GENERIC TYPE	SOLIDS BY VOL. (%)**	DFT THICKNESS (PER COAT)	TNEMEC PRODUCT
AGE	Alkyd-Enamel	49	2.0-3.0	2H Tnemec-Gloss
AL	Emulsified Acrylic	43	2.0-3.0	Series 6
APE	High Build Acrylic Polyurethane Enamel	60/ 74	3.0-5.0	Series 73/74
BF	Cementious Acrylic Filler	68	100 sq. ft. per gal.	Series 130
CMS	Clear Masonry Sealer			Chemprobe prime appel
CS	Concrete Stain	7	100 sq. ft. per gal.	Conformal
CSC	Concrete Surfacer Compound	100	1/8"-1/4"	63-1500
EM	Exterior Masonry Coating	45	6.0-8.0	Series 156
HSE	High Solids Catalyzed	82	6.0-8.0	Series 104 H.S.

	Epoxy			
HSL	High Solids Catalyzed Epoxy	82	6.0-8.0	Series 61
LTE	Polyamide Epoxy	58	4.0-6.0	Series 161
PE*	Polyamide Epoxy	60	5.0-7.0	Series 161/66
PVA	Vinyl-Acrylic-Latex	28	2.0-3.0	Series 51-792
RPP	Alkyd-Phenolic	43	2.5-3.5	Series 37 H.
ZR	Zinc Rich Primer	63	3.0-3.5	Series 91 H ₂ O

* If application of PE type coating occurs during low temperatures, provide and apply LTE type coating in lieu of PE and substitute throughout in Paint Schedule at end of Section, unless otherwise recommended by coating manufacturer.

** Solids by volume based on Tnemec Coatings.

C. Description of coating types includes minimum acceptable percent, by volume, of component solids and volatile organic compounds (V.O.C.). Brand identification is keyed to products of Tnemec Co., Inc., Kansas City, MO, to establish standard of quality. Products meeting general physical characteristics and performance criteria, manufactured by Koppers Co., Inc., or Valspar Corp., or approved equal are acceptable.

S 22.15 PIPE AND EQUIPMENT COLOR CODING

A. Match the color of the final coats as closely as possible, without custom blending, to the color tabulated under "BACKGROUND" for the specific service as given in the General Color Code.

S 22.16 STENCILED SIGNAGE

A. Gallery Signage:

1. Provide one stenciled gallery name sign every 200-feet along gallery walls. Stencil letters shall be 3-inches high in black letters with white background.
2. Paint shall be compatible for use on concrete surfaces.

PART 3 - EXECUTION

S 22.17 INSPECTION

- A. Examine (new and existing) surfaces scheduled to receive paint and finishes for conditions that will adversely affect execution, permanence or quality of work and which cannot be put into an approved condition through preparatory work.
- B. Do not proceed with surface preparation or coating application until after submitting to the Engineer a letter signed by Contractor, stating that surfaces to be painted are in acceptable condition for preparation and coating according to the painter and in accordance with paint manufacturer's printed instructions.
- C. Clean and paint before assembly, surfaces inaccessible after assembly, unless such areas are seal welded.
- D. Before enclosure, apply 1/8-inch thick trowel grade bituminous mastic coating to steel encased in exterior masonry walls.
- E. Paint not allowed on steel fully encased with cast-in-place concrete.

S 22.18 PREPARATION

- A. Basic Steps:
 1. Prepare and paint surfaces in heated enclosure unless the ambient weather conditions ensure still, dry air above 50 degree F temperature, and humidity above manufacturer's printed recommended level. Do not apply paints to surfaces in direct sunlight. Conform to manufacturer's printed instructions for safety requirements.
 2. Coordinate cleaning and painting operations to eliminate contamination of one by the other.
 3. Maintain coating materials at manufacturer's recommended mixing and application temperatures for not less than 24-hours before use. Have clean containers, spray equipment, applicators and accessory items ready for use before decanting or mixing paint materials.
 4. Coordinate materials to be applied with previous coatings on affected surfaces. Obtain, in all cases, manufacturer's written directions, and follow them strictly, except where otherwise specified.

5. Coordinate preparation and material compatibility requirements with the work specified in the following:
 - a. Division 9 Section "Shop Painting."
 - b. Division 15 Sections.
 - c. Division 11 Sections.

- B. Before any paint application, clean surfaces to be coated of dust, dirt, grease, loose rust, mill scale, paint unsuitable for top coating, efflorescence, oil, moisture, foreign matter or similar conditions detrimental to coating bond and durability.
 1. Following cleaning, apply preparatory treatment in strict accordance with manufacturer's written instructions.
 2. Fill imperfections and holes in surfaces to be painted with material recommended by paint manufacturer.

- C. Metals to Receive Paint Finishes:
 1. Prepare ferrous metals, including field welds and unprimed shop welds, without shop prime coats as follows:
 - a. Near White blast cleaned (SSPC-SP-10), for Type S service.
 - b. Commercial blast cleaned (SSPC-SP-6), for Type E service.
 - c. Use needle gun for field welds and shop welds which occur in narrow, unprimed areas in an otherwise shop primed surface, followed by SSPC-SP1-solvent wipe.
 2. Clean ferrous metals with shop primers as previously specified, then:
 - a. Prepare surface to meet manufacturer's printed recommendations for Type E or S service.
 3. Epoxy coated metals for paint finish: Clean of dirt, grease, oil and foreign matter.
 4. Non-ferrous and galvanized metal surfaces for finish: Clean of dirt, grease, oil, and foreign substances, wash thoroughly with grease solvent, then permit to dry. Apply one coat of epoxy primer to non-ferrous surfaces.

- D. Concrete to Receive Paint Finishes:
 1. Clean thoroughly of form oil, release agents, dirt, dust, grease, paint, loose material and foreign matter. Remove laitance, roughen smooth surfaces by brush sand blasting, remove fins and projections, fill voids and honeycombs with material recommended by paint manufacturer.
 2. Prime after concrete has dried in strict accordance with manufacturer's printed instructions.

3. Concrete in Immersion: Brush blast all new and existing surfaces to receive coating to achieve profile of 2.0-4.0 mils. Previously coated surfaces shall be inspected and evaluated prior to commencing work.
- E. Provide higher degree of cleaning for acceptable equivalent paint products when paint manufacturer recommends in his printed surface preparation recommendations.
- F. Delay painting of areas which will be damaged by heat from welding, until welding is complete. Reclean and recoat substrate as specified for original coats, when coated areas have been damaged by welding or have not been painted to allow welding.
- G. Surface Preparation for Galvanized Metals and Non-Ferrous Metals:
 1. Brush blasts all exterior and "wet" interior exposures. Galvanized metal surfaces to receive a uniform profile of .75-1.25 mils.
 2. For interior galvanized and non-ferrous metals not exposed to wet environments apply in accordance with manufacturers written instructions.

S 22.19 TOUCH-UP

- A. Before applying field coat, touch-up abraided areas of shop coats with paint of the same type. Apply an entire coat to abraided area. Touch-up coats are in addition to, and not a substitute for first field coat. Clean deteriorated surfaces to bare metal before applying touch-up coat.
- B. Equipment, motors, pumps, instrumentation panels, electrical switchgear, and similar items with shop coats, paint filler, enamel or other treatment customary with manufacturer; after installation, touch-up scratches and blemishes before applying field coats.

S 22.20 APPLICATION

- A. Apply one under coat and one finish coat to previously primed surfaces. Following careful inspection of surfaces not previously primed, prepare and clean as specified, apply prime coat, one under coat, and one finish coat. Refer to Paint Schedule at end of this specification for coating requirements. Provide additional prime, under, and finish coats as specified, indicated, and recommended by coating manufacturer's printed instructions.
- B. Conditions:
 1. Do not apply paints or other finish to wet or damp surfaces, except in accordance with instructions of manufacturer. Do not apply exterior paint during cold, rainy, or frosty weather, or when temperature is likely to drop to freezing. Do not apply paints to surfaces in direct sunlight.

2. Paint surfaces which have been cleaned, pretreated, or otherwise prepared for painting with first field coat as soon as practicable after such preparation has been completed, but in any event prior to deterioration of prepared surface.
3. Coat blast cleaned metal surfaces in accordance with SSPC guidelines, before any rusting or other deterioration or contamination of the surface occurs. Do not coat blast cleaned surfaces later than 8 hours after cleaning.

C. Methods:

1. Spraying with apparatus may be substituted for brush application of paints in locations approved for spraying.
2. Prepare surfaces, mix and apply paint materials in strict accordance with manufacturer's printed instructions and recommendations. Control temperature of materials upon mixing and application, surface temperature and condition, thinning and modifying.
3. Protect surfaces to be coated, before, during and after application.

D. Workmanship:

1. Apply spot prime of aluminum paints to exposed nails and other ferrous metal on surfaces to be painted with water-thinned paints.
2. Apply coating materials to meet manufacturer's spreading rate and dry film thickness recommendations. Dry film thicknesses specified are constant for brush, spray, roller or other form of application.
 - a. Control thinning in accordance with V.O.C. regulations for spray use and to manufacturer's printed instructions, and produce specified dry film thickness on level surfaces, interior and exterior angles.
 - b. Record quantities of materials of each type, for each coat, used in each location.
3. Apply paints and coatings using painters continuously employed in the painting profession for no less than five (5) documented years, brushed or rolled out carefully to a smooth, even coating without runs or sags. Flow enamel on evenly and smoothly. Allow each coat of paint to dry throughout the film thickness, before the next coat is applied. High polymer coatings may be excepted from the drying requirement if recoat time is specified by manufacturer.
4. Finish surfaces: Uniform in finish and color, and free from flash spots and brush marks.

S 22.21 PROTECTION AND CLEAN-UP

- A. Protect surfaces to be painted or coated under this Section as follows:

1. Arrange for preparation and coating activities to be performed in areas and during times when no continuous traffic and no dust generating activity will be present.
 2. During time between preparation and coating, protect work from dust and dirt with dropcloth. Do not allow contact with surfaces in this time period.
 3. During painting activity, clearly mark the area being used by painters to prevent interference with painting being applied as specified.
 4. After painting, clearly barricade painted surfaces with cones, plastic barrier tape, or other visible barrier. Locate "WET PAINT" signs near painted surfaces. Do not remove barriers and signs until paint surface dries throughout entire film thickness.
- B. Remove or completely mask accessory items, finish hardware, lighting fixtures, escutcheon plates, trim and similar finish items not to be painted before painting adjacent surfaces. Carefully replace and reposition upon completion of adjacent painting and cleaning work.
- C. Upon completion of the work, clean up paint spots, oil, and stains from floors, glass, hardware, and similar finished items and remove tape.

S 22.22 ITEMS NOT TO BE FIELD PAINTED

- A. The following items will not require field painting:
1. All pipe supports

S 22.23 SCHEDULE OF PAINTING (UNLESS OTHERWISE SPECIFIED)

- A. Coordinate and schedule the various cleaning, touch-up and finishing operations. Transmit and coordinate the transmission of materials data, color selections and coating system methods between the coating applicators. Do not exceed exposure and recoat time limits.

Item No.	Surface or Item	PAINT SCHEDULE		
		1 st	2 nd	Final
1	Interior concrete to be painted (if not otherwise noted, these field coats shall be used).	PE	-	PE
2	Interior concrete indicated to be glaze painted	PR	-	PE
3	Interior galvanized hollow metal doors and frames, including elevator hoistway doors and frames	PE	-	PE
4	Ferrous parts of operating devices, valve handles	PE	-	PE

PAINT SCHEDULE

Item No.	Surface or Item	Field Coats		
		1 st	2 nd	Final
	and supports (Note 6)			
5	Valve handles, hydrants, floor stands, and operating devices and supports, guard posts, bollards, (Note 6)	PE	PE	APE
6	Underside of metal deck (Interior)	PE	-	PE
7	Underside of metal deck (Exterior)	PE	-	APE
8	Interior Insulated Ductwork	AL	-	AL
9	Uninsulated copper piping, fittings, valves and pipe hangers and supports	PE	-	PE
10	Emulsified asphalt-coated ferrous piping	AL	-	AL
11	Exposed electrical conduit, conduit fittings, and outlet boxes (Against field painted concrete masonry units only)	PE	-	PE
	(Against metal panels)	RPP	AGE	AGE
12	Exterior equipment with Type S service prime coats (Note 4 & 6)	PE	HSE (touch-up)	HSE
13	Exterior exposed equipment with Type E service prime coats (Note 4 & 6)	PE	PE (touch-up)	APE
14	Interior equipment with Type S service prime coats (Note 4 & 6)	PE	HSE (touch-up)	HSE
15	Interior equipment with Type E service finish coats (Note 4 & 6)	PE	PE	PE
16	Items with factory finish	Touch-up with materials supplied by manufacturer		
17	Exterior concrete indicated to be stained (Note 2)	CS	-	CS
18	Exterior plaster	AL	-	AL
19	Exterior CMU and concrete to receive protective, Breathable coating	AL	-	AL
20	Concrete in immersion exposed to acid attack	HSE	CSC	HSE

- Notes:
1. Spray apply and back roll.
 2. Concrete stain (CS): Canyon Tone, manufactured by United Coatings; Geotone Stain, manufactured by G.C.S. Coatings, Inc.; Tnemec-Prime Appel 200.
 3. If prime coat has been exposed for more than 6 months, Painting Subcontractor will provide test patches to insure adhesion of field-applied coatings. Test patches in accordance with paint manufacturer's instructions.
 4. Provide patching compound for concrete surfaces in accordance with Paint Manufacturer's recommendations.
 5. Pipe supports for plumbing and HVAC shall be shop painted and touch-up only under Division 15. All other pipe supports shall be shop painted and touch-up only under Division 9 Section "Shop Painting."

S 22.24 FINAL TOUCH-UP

- A. Prior to final completion and acceptance, examine painted and finished surfaces and retouch or refinish areas to leave touched-up areas with same appearance as and even with the surrounding finish specified.
- B. After doors have been fitted and hung, refinish edges, tops and bottoms.

S 22.25 TESTING

- A. Conduct field testing in the presence of the Engineer for specified mil thickness in accordance with SSPC-PA-2.
- B. Test results shall meet requirements of SSPC-PA-2. Failure of test results shall require that surfaces be repainted until approved results of testing have been obtained for the specified mil thickness.

S 22.26 PROJECT CLOSEOUT

- A. Provide in accordance with these Specifications.

END OF SECTION S-22

SECTION S-23 PUMPS AND APPURTENANCES

PART 1 – GENERAL

S 23.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Division 1 Specification Sections, apply to this Section.

S 23.02 SUMMARY

- A. Each grinder pump shall be a heavy duty pump used as a grinder. Each grinder pump shall contain special cutters to reduce sewage to a fine slurry. The stationary cutter and the rotary cutter shall consist of hardened stainless steel. The cutter materials shall provide maximum corrosion and abrasion resistance. The remaining portion of the grinder pumps, with the exception of the seal materials and wet end, shall be similar to the heavy duty pumps used in larger pump stations for daily operations.
- B. Wet well and Valve Vault discharge piping shall be Sch. 80 PVC to the limits shown on the Contract Drawings and as specified herein.
- C. Related Sections: the following sections contain requirements that relate to this Section:
 - 1. Section S-07 - Valves

S 23.03 REFERENCES

- A. Hydraulic Institute: Current Standards:
- B. American Society for Testing and Materials (ASTM) Publications:
 - 1. A36: Specification for Structural Steel.
 - 2. A48: Specification for Gray Iron Castings.
 - 3. A185: Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - 4. A322: Specification for Carbon and Alloy Steel Bars.
 - 5. A536: Specification for Ductile Iron Castings.
 - 6. A615: Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 7. A743: Specification for Castings, Iron-chromium, Iron-Chromium Nickel, and Nickel-Base Corrosion-Resistant for General Application.
 - 8. B584: Specification for Copper Alloy Sand Castings for General Application.
 - 9. C33: Specification for Concrete Aggregates.
 - 10. C150: Specification for Portland Cement.
- C. American National Standards Institute (ANSI):
 - 1. B196.1: Standard for Cast Iron Pipe Flanges and Flanged Fittings, 125 lb.

- D. American Bearing Manufacturers Association (ABMA):
 - 1. Standard 9-90 Load Ratings and Fatigue Life for Ball Bearings.
 - 2. Standard 11-90 Load Ratings and Fatigue Life for Ball Bearings.

S 23.04 SYSTEM DESCRIPTION

- A. Pump capacities and operating data shall be as indicated on the Contract Documents and within this specification.
- B. The pump manufacturer for the submersible pumps shall be responsible for the associated pump control and wet well level control system and shall assume overall system operational responsibility between the pumping units and the wet well level control system.
- C. Pumps, mechanical seals, and motor units shall be from the same manufacturer. Pumps, mechanical seals, and motor units from separate manufacturers will not be accepted.

S 23.05 SUBMITTALS

- A. Submittal data shall be provided to show compliance with these specifications, plans or other specifications that will influence the proper operation of the pump(s).
- B. Standard submittal data for approval must consist of:
 - 1. Performance curves
 - 2. Pump outline drawing
 - 3. Detailed electrical data
 - 4. Control drawing and data. Custom system schematic drawings shall be provided. Manufacturers catalog cuts or standard drawings showing, circuitry not used on this project are specifically not acceptable.
 - 5. Typical installation guides
 - 6. Technical manuals
 - 7. Parts lists
 - 8. Printed warranty (Provided by the WPCA for pumps)
 - 9. Manufacturer's equipment storage recommendations
 - 10. Manufacturer's standard recommended start-up report form
 - 11. Motor performance curve

- C. Lack of the above requested submittal data is cause for rejection.

S 23.06 QUALITY ASSURANCE

- A. The pump, mechanical seals and motor units provided under this specification shall be from the same manufacturer in order to achieve standardization of operation, maintenance, spare parts, manufacturer's service and warranty. A factory authorized service

facility shall be available to provide complete warranty services, repair services and spare parts. This facility shall be located within the state of New Jersey.

- B. Replace all materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner and acid solder at no additional cost to the Owner.
- C. Coordinate dimensions and drilling of flanges with flanges for valves, pumps and other equipment to be installed in piping systems. Bolt holes in flanges to straddle vertical centerline.
- D. Qualification for Pipe Support Structural Attachment Welders: Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests. If recertification of welders is required, retesting is the Contractor's responsibility at no additional cost to the Owner.
- E. Protect piping from dirt, dust, oil, grease, and other foreign matter during installation to prevent debris from being left in piping.

S 23.07 SHOP DRAWINGS

- A. Shop drawings for all products and equipment specified and/or referred to herein shall be submitted to the Engineer for review prior to their manufacture and/or shipment.
- B. Submittals shall contain complete detailed shop drawings and literature on all equipment, including descriptions, diagrams, parts and listing of construction materials as required to indicate full conformance with the specifications. Partial submittals of shop drawings or equipment data will not be reviewed or approved.
- C. Shop drawings and equipment data shall be complete with respect to dimensions, materials of construction, design/performance criteria, wiring diagrams, component parts, etc., to enable the Engineer to conduct a complete review of all equipment specified. Submittals shall be comprehensive and must fully address and contain:
 - a. Schematic electrical wiring diagrams, piping layouts, and descriptive literature on each item of equipment to be furnished as specified for a complete installation.
 - b. Certified performance or test data as may be prescribed for the select equipment components specified in the following sections.
 - c. A comprehensive painting/finish schedule shall also be submitted, summarizing paints, damp proofing and waterproofing materials and/or special coatings to be utilized.
 - d. Each submittal set shall be fully indexed and shall be bound in a three ring vinyl binder.
 - e. At the time of submission the Contractor shall, in writing, call the Engineer's attention to any deviations from the requirements of these specifications that are contained in the submittal documents. Deviations or omissions in the submittal drawings and related data shall not relieve the Contractor from his responsibility

for providing the specified requirements unless the Engineer has given written approval for the deviations or omissions identified.

S 23.08 DELIVERY, STORAGE AND HANDLING

A. Shipping:

1. Ship equipment, material and spare parts complete except where partial disassembly is required by transportation regulations or for protection of components.
2. Pack spare parts in containers bearing labels clearly designating contents and pieces of equipment for which intended.
3. Deliver spare parts at same time as pertaining equipment. Deliver to the Owner after completion of work.

B. Receiving:

1. Inspect and inventory items upon delivery to site.
2. Store and safeguard equipment, material and spare parts in accordance with manufacturer's written instructions.

S 23.09 SPECIALTY PUMP TECHNICIAN SERVICES

A. The pump supplier shall provide the services of a factory trained technician to provide the following services:

1. Instruct the Contractor on proper installation of the equipment.
2. One day or one job site visit for pre-startup assistance.
3. One day or one job site visit for start-up of pumps, controls and all other equipment supplied.
4. One day or one job site visit to instruct owner's personnel on the operation and maintenance of all equipment supplied.

B. The technician shall be fully trained in the installation, operation and maintenance of the pumps, controls and all other equipment supplied. A resume and factory trained certification for all equipment being provided shall be included in the submittal package. The pump technician must have at least five years of experience servicing pumps and be a full-time service employee. Start-up services by salesperson are not acceptable. The technician shall perform the following tests after the pumps have been completely installed and wired:

1. Megger stator and power cables
2. Check seal lubrication
3. Check for proper rotation
4. Check power supply voltage
5. Measure motor operating load and no load current
6. Check level control operation and sequence
7. Check functioning of seal fail devices

8. Check impeller adjustment against specifications
9. Check for debris in station that may damage pumping equipment
10. Check for proper functioning of guide rail system by raising and lowering the pump while submerged.

C. During this initial inspection, the manufacturer's service representative shall review recommended operation and maintenance procedures with the owner's personnel.

S 23.10 SPARE PARTS

A. The following spare parts shall be available at a stocking and service facility within 50 miles of the installed equipment. Spare parts shall be available for each size and type of pump and control installed.

1. Impeller
2. Stator
3. Rotor
4. Mechanical Seals complete
5. Pump Casing
6. Wear Rings
7. O Rings
8. Control PLC

B. A notarized statement shall be part of the submittal, confirming that these parts are available for inspection by the Engineer or Owner. Should the pump supplier be unable to meet this requirement, the spare parts listed shall be supplied as part of the installation.

S 23.11 SERVICE CONTRACT

A. The pump and control vendor shall also be a service company. The service company shall be available on a 24 hour basis and with complete capabilities for service. Service shall mean that fully trained pump and control service technicians shall be available during and after office hours for site visits. Service company shall have full capabilities to provide emergency pumping if required. Emergency pumping shall include, temporary pumps, controls, piping systems, set up and operation if required. Technicians shall be equipped with a fully stocked service vehicle capable of lifting up to 10,000 lbs. Service company shall have new complete pumps in stock for immediate replacement if required. Service company shall offer annual inspection contracts if required.

S 23.12 TESTING

A. Testing performed upon each pump shall include the following inspections:

1. Impeller, motor rating and electrical connections shall be checked for compliance with this specification.
2. Prior to submergence, each pump shall be run dry to establish correct rotation.

3. Each pump shall be run submerged in water.
4. Motor and cable insulation shall be tested for moisture content or insulation defects.

S 23.13 GUARANTEE

- A. In addition to the general guarantee required in these specifications, the pump manufacturer shall furnish the owner with a written warranty to cover the pump and motor against defects in workmanship and material for a period of 12 MONTHS of operation under normal use and service. The warranty shall be in printed form and previously published as the manufacturer's standard warranty for all similar units manufactured.

S 23.14 FACTORY SERVICE

- A. Factory-approved service facilities with qualified factory-trained mechanics shall be available for prompt emergency and routine service.

S 23.15 EXPERIENCE

- A. The pump manufacturer shall have a minimum of 10,000 heavy-duty, submersible wastewater pumps installed and operating for no less than 5 years in the United States.

S 23.16 MANUFACTURERS

- A. The pump, mechanical seals and motor shall be from the same manufacturer.
- B. The pump, mechanical seals and motor manufacturer shall be ITT Flygt.

PART 2 – PRODUCTS

S 23.17 MANUFACTURERS

- A. Submersible Sewage Pumps:
 1. ITT Flygt Corporation.
 2. To be purchased and stored by the Brookfield WPCA until such time that the Contractor will take delivery and install:
 - a. It should be noted that the specification for the Submersible Grinder Pump is based on ITT Flygt Corporation Model Number MP3127.890.

S 23.18 CONDITIONS OF SERVICE

- A. Each Grinder Pump shall be capable of providing the hydraulic conditions as specified in the Pump Schedule.
- B. The Contractor shall install two (2) submersible wastewater grinder pumps. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA approval.

- C. The pump shall be supplied with a mating cast iron two (2") inch discharge connection capable of delivering 100 gpm at 93 feet of total dynamic head (TDH). Shut off head shall be 112 feet (minimum). Each pump shall be fitted with twenty (20) feet of lifting chain. The working load of the lifting system shall be 50% greater than the pump unit weight.
- D. The Grinder Pump shall be automatically and firmly connected to the discharge connection, guided by no less than two (2) guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet well. No portion of the pump shall bear directly on the sump floor.

S 23.19 PUMP CONSTRUCTION

- A. The Sewage pumps shall be heavy-duty, electric submersible wastewater grinder units, designed for handling raw, un-screened sewage and wastewater.
- B. The pump and motor unit shall be suitable for continuous operation at full nameplate load while the motor is completely submerged or totally non-submerged. The use of shower systems, secondary pumps or cooling fans to cool the motor will not be acceptable.
- C. Major pump components shall be of gray cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities.
 - 1. All exposed nuts or bolts shall be AISI Type 304 stainless steel.
 - 2. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.
- D. Sealing Design:
 - 1. Incorporate metal-to-metal contact between machined surfaces.
 - 2. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile O-rings.
 - 3. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit. Rectangular cross-sectioned gaskets requiring specific torque limits to achieve compression will not be acceptable. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.
- E. Cooling System:
 - 1. Motors shall be sufficiently cooled by the surrounding environment or pumped media. A water jacket shall not be required.
 - 2. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F.
- F. Cable Entry Seal:

1. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal.
2. The cable entry seal shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable.
3. The assembly shall provide ease of changing the cable when necessary using the same entry seal.

G. Bearings:

1. Pump shaft shall rotate on two (2) bearings.
2. Motor bearings shall be permanently grease lubricated.
3. Upper and lower bearings shall be single row ball bearings.
4. Sleeve bearings are not acceptable.

H. Seal:

1. Mechanical Seal:
 - a. Provide tandem mechanical shaft seal system consisting of two (2) totally independent seal assemblies.
 - b. Seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate.
 - c. Lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating, corrosion resistant tungsten-carbide ring.
 - d. Upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary ceramic seal ring and one positively driven rotating carbon seal ring.
 - e. Each seal interface shall be held in contact by its own spring system.
 - f. Seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing.
 - g. Position of both mechanical seals shall depend on the shaft.
 - h. Mounting of the lower mechanical seal on the impeller hub will not be acceptable.
 - i. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces will not be acceptable.
 - j. Cartridge type systems will not be acceptable.
 - k. Systems requiring a pressure differential to offset pressure and to effect sealing will not be acceptable.
 - l. Pump shall be provided with a lubricant chamber for the shaft sealing system.
 - 1) Lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity.
 - 2) Drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside.

- 3) Seal system shall not rely upon the pumped media for lubrication.
- 4) Motor shall be able to operate dry without damage while pumping under load.
- 5) Seal lubricant shall be FDA Approved, nontoxic.

I. Pump Shaft:

1. ASTM Type 431 Stainless Steel.
2. Pump and motor shaft shall be the same unit.
3. Pump shaft shall be extension of motor shaft. Couplings will not be acceptable.

J. Impeller:

1. Gray cast iron, Class 30B.
2. Dynamically balanced, single shrouded design having a long throughlet without acute turns.
3. The impellers shall be capable of handling fine slurry from the special cutters.
4. Impellers shall be taper collet fitted and retained with an Allen head bolt.
5. All impellers shall be coated with an acrylic dispersion zinc phosphate primer.

K. Volute:

1. Single-piece gray cast iron, ASTM A48 Class 35B.
2. Non-concentric design with smooth passages large enough to pass any solids that may enter the impeller.

S 23.20 PUMP SCHEDULE

- A. Pumps must be designed to handle raw, unscreened, domestic sanitary sewage. Each pump shall be selected to perform under the following operating conditions:

Location – Station 1	Pump Station
Material Being Pumped	Raw domestic sanitary sewage.
Number of Units	2
Rate of Flow at Rating Point (gpm)	Rating Point : 56
Total Dynamic Head at Rating Point (ft)	TDH@RP: 60
Motor Horsepower, max (hp)	2 (min)
Service factor	1.15
Motor Enclosure Type	Submersible/Grinder

Location – Station 3	Pump Station
Material Being Pumped	Raw domestic sanitary sewage.
Number of Units	1
Rate of Flow at Rating Point (gpm)	Rating Point : 25
Total Dynamic Head at Rating Point (ft)	TDH@RP: 55
Motor Horsepower (hp)	1 (min)
Service factor	1.15
Motor Enclosure Type	Submersible/Grinder

Location – Station 7	Pump Station
Material Being Pumped	Raw domestic sanitary sewage.
Number of Units	2
Rate of Flow at Rating Point (gpm)	Rating Point : 56
Total Dynamic Head at Rating Point (ft)	TDH@RP: 44
Motor Horsepower (hp)	2 (min)
Service factor	1.15
Motor Enclosure Type	Submersible/Grinder

Location – Station 8	Pump Station
Material Being Pumped	Raw domestic sanitary sewage.
Number of Units	1
Rate of Flow at Rating Point (gpm)	Rating Point : 25
Total Dynamic Head at Rating Point (ft)	TDH@RP: 63
Motor Horsepower (hp)	1 (min)
Service factor	1.15
Motor Enclosure Type	Submersible/Grinder

Location – Station 9	Pump Station
Material Being Pumped	Raw domestic sanitary sewage.
Number of Units	1
Rate of Flow at Rating Point (gpm)	Rating Point : 25
Total Dynamic Head at Rating Point (ft)	TDH@RP: 70
Motor Horsepower (hp)	1 (min)
Service factor	1.15
Motor Enclosure Type	Submersible/Grinder

S 23.21 LIFT SYSTEM

- A. Provide Type 304 Stainless Steel lifting chain for each pump of adequate length to accommodate wet well depth.
- B. System shall be appropriately sized for weight of pump to be lifted.
- C. Working load of lifting system shall be 50% greater than the pump unit weight.

S 23.22 GUIDE BAR MOUNTING

- A. Each pump to be furnished with a guide rail system consisting of a dual rail system connected to a discharge head and to an upper guide bar holder mounted to the access frame. The guide rail system shall consist of stainless steel guide bar brackets and schedule 40 Type 304 stainless steel pipe.
- B. There shall be no need for personnel to enter the wet-well.
- C. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal-to-metal watertight contact.
 - 1. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable.
- D. No portion of the pump shall bear directly on the sump floor.

S 23.23 MOTOR

- A. Provide in accordance with Design Drawings and as specified and indicated.
- B. Horsepower rating of motors: As specified in the “Pump Schedule” in Section 23.20 of this Section.
 - 1. Not less than maximum brake horsepower requirements of pumps under any condition of operation specified and indicated without operating in the motor service factor.

- C. Induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber, NEMA B type.
- D. Stator windings and leads shall be insulated with moisture resistant Class F insulation rated for 311 degrees F.
 - 1. Stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted into the stator housing.
- E. The use of bolts, pins, or other fastening devices requiring penetration of the stator housing will not be acceptable.
- F. Designed for continuous duty handling pumped media of 104 degrees F.
- G. Capable of 15 evenly spaced starts per hour.
- H. Rotor bars and short circuit rings:
 - 1. Cast aluminum.
- I. Motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.
- J. Service Factor: 1.10
- K. Rating: 460V/3 PH/60 Hz
- L. Power cable:
 - 1. Sized according to NEC and ICEA standards.
 - 2. Provide sufficient length to reach junction box without splices.
 - 3. Outer jacket:
 - a. Oil resistant chloroprene rubber.
 - 4. Suitable for continuous submergence underwater without loss of watertight integrity.
 - a. Suitable for depths of 65 feet.
- M. Motor protection:
 - 1. Provide Flygt MiniCas II for seal failure and over temperature alarms for submersible pumps powered by the Pump Control Panel.
 - 2. Thermal switches:
 - a. Stators shall incorporate thermal switches in series to monitor the temperature of each phase winding.
 - b. At 125 degrees C (260 degrees F), thermal switch shall open, stop the motor, and activate an alarm.
 - 3. Thermal switches shall be connected to monitoring unit, which is mounted on the inside of the control panel.

S 23.24 MAIN PUMP CONTROL SYSTEM

- A. Summary

1. The pumps shall be operated locally at the Pump Control Panel. In addition, the conditions specified below shall be remote monitored by the Authority's existing Mission Controls Systems.

B. Levels of Control

1. Provide Hand/Off/Auto switch for each pump on Operator Interface Terminal (OIT). In "Hand" position, the pump runs continuously. "Off" position stops the pump and disables Hand and Auto operation. In "Auto" position, the pump shall be controlled by the Controller logic.
2. Provide Lead/Lag switch on OIT to allow selection of either Pump No.1 or No.2 to lead with the other pump to lag.
3. Provide alternation On/Off switch on OIT. In the "On" position, the lead pump shall change after either one or both pumps stop and Wet Well level reaches the preset level to start a pump. In "Off" position, there shall be no alteration of pumps.

C. Pump Operation

1. As level rises, start lead pump at preset level (established from level transducer). If level continues to rise, start lag pump at preset level. As level descends, stop either or both pumps at preset level.
2. If the Wet Well level sensor fails, the high float switch shall start both pumps and initiate alarm that transducer has failed. The low level float switch shall stop pumps.
3. Cycle each sewage pump on and off automatically to maintain Wet Well sewage level. Automatic control operates both pumps in parallel if Wet Well level rises above starting point of low-level pump, until shutoff level is reached. Automatic alternator, with manual disconnect switch, changes sequence of lead-lag sewage pumps at completion of each pumping cycle.

D. Status

1. Provide the following status:
 - a. Pumps No. 1 and 2 on/off

E. Alarms

1. For Wet Well levels, the following alarm assertion states shall be programmed into the Controller software: Low-Low, Low, High and High-High. The exact engineering units shall be coordinated with the Authority prior to commissioning.
2. Provide the following alarms:
 - a. Pump high temperature and moisture detection.

- b. Pump failed to start after an adjustable time period (0 – 60 seconds) based on no flow.
- c. Pump Running
- d. Power Failure

F. Required Features:

1. The Contractor shall provide a three-phase silicon oxide lightning arrestor on the incoming power lines.
2. Power supply to each motor shall be capable of being locked in the “open” position to shut-off power supply to each motor in compliance with the National Electrical Code.
3. Each pump motor shall be provided with a solid state reduced voltage motor starter with full speed bypass mounted in the pump control panel as follows:
 - a. Manufacturers:
 - 1) Cutler Hammer model S811 Softstarter Motor Controller.
 - 2) Or approved equal.
 - b. Shall include a full speed bypass to minimize heat generation during run time. The bypass automatically closes when the motor reaches its nominal speed, resulting in a cooler running component.
 - c. The controls shall be the same when Pump Station is running off of either the Softstarters or Bypasses.
 - d. Shall incorporate a microprocessor-controlled electronic overload with adjustable trip class, motor and system diagnostics, configurable auxiliary contacts and multiple start and stop modes. The unit shall provide easy and secure setup through the use of dip switches for precise and secure setting of the start/stop profile, overload trip class and auxiliary contact characteristics. The overload full load current setting is accomplished using a rotary pot located on the front of the device.
 - e. Each starter circuit shall be independently fused.
 - f. Loss of phase, phase reversal and low voltage shall be monitored by an adjustable voltage phase monitor relay.
 - g. Time delays shall be included to prevent nuisance tripping caused by transients. Each phase input to the phase monitor shall be fused.
 - h. A phase loss protection relay shall be provided for each pump motor.
 - i. Voltage dips up to 20% and frequency dip up to 10% during starting shall be accommodated by the starter without malfunction.
 - j. Solid-state reduced voltage motor starter shall be mounted on the inside of the Electrical Equipment Enclosure.
4. Loss of phase, phase reversal and low voltage shall be monitored by an adjustable voltage phase monitor relay. Time delays shall be included to prevent nuisance tripping caused by transients. Each phase input to the phase monitor shall be fused.

G. Pump Control Panel

1. Pump Controls Panel shall be mounted in a NEMA 1 panel within the Electrical Equipment Enclosure. Pump Control Panel to be no larger than 24" x 24" x 10".

2. Provide a Manual Reset Pushbutton on front of Pump Control Panel to allow Operator to manually reset system.
3. Pump Controller
 - a. The lift station controller shall be a preprogrammed, microprocessor based; controller capable of monitoring 4-20mA signals and automatically control one to three pumps. Systems using custom programming and a generic controller will not be acceptable.
 - b. The operator interface shall display the current level in feet and represent the level in bar graph form, dynamically updating based on the level in the wet well. A graphic representation of each pump and its status shall be displayed on the same screen along with flow in gallons per minute. The operator interface shall be a 3.5" 160 x 128, Transflex touch screen graphic display viewable in direct sunlight. The operator interface shall be suitable for Type 12, 4 & 4X environment. Additionally, the front panel shall be manufactured from a UV resistant polyester substrate.
 - c. The controller shall be capable of operating in automatic mode with the provided internal alternator and shall have the capability of being put into fixed mode at any time. Alternation shall also have the capability to alternate cyclically or within an adjustable period of time.
 - d. A two level security system shall be provided for operators (OPER) and supervisors (SUPER). Without being logged in, screens are view only.
 - A. OPER – has ability to change setpoints and acknowledge alarms.
 - B. SUPER – has same privileges as operator plus can change the supervisor and operator passwords and is allowed to toggle the MODBUS communications port into program mode.
 - e. A 2GB removable mass storage device shall be provided to store a backup of the program and historical data.
 - f. The controller shall come standard with 24 discrete inputs, 16 discrete outputs and two analog inputs.
 - g. Controller Communications
 - A. The controller shall include two RS-232/RS-485 serial ports in addition to the CAN network port. A control algorithm shall be provided that supports MODBUS RTU address. When enabled, this communication feature shall allow the controller to communicate over optional telemetry equipment.
4. The panel shall provide the following output signals to the Authority's Mission Controls System:
 - a. Pump 1 Running
 - b. Pump 1 Alarm
 - c. Pump 2 Running
 - d. Pump 2 Alarm
 - e. Normal Power Loss
 - f. High-High Level Float
 - g. Low-Low Level Float
 - h. Generator Running

- i. Generator Fail
 - j. ATS Emergency
 5. The Pump Station Controller shall be an LSC Controller as manufactured by ICS Healy-Ruff.
 6. Intrinsically safe barriers shall be provided in the Pump Control Panel for the analog signal from submersible level transducer and digital contacts from float level switches and pump control wires to isolate these signals coming from Class I, Division 1 hazardous locations. Barrier requirements are as follows:
 - a. Analog Signal:
 - 1) Supply Voltage: +24 to +26 Vdc
 - 2) Circuit Current: 4-20 mA
 - 3) Replaceable Fuse Current: 160 mA
 - 4) Product and Manufacturer: Series 9002 as manufactured by Stahl or approved equal.
 - b. Digital Contact:
 - 1) Control Voltage: 24 or 120 Vac, $\pm 10\%$, 60 Hz
 - 2) Control Switch: 16 Vdc open circuit voltage, 200 μ A short circuit current
 - 3) Contact Rating: SPST, N.O. 10 Amps at 24 or 120 Vac
 - 4) Input and Output Isolation: 2,500 Volts
 - 5) Response Time: 6 msec operate, 2.5 msec release
 - 6) Duty Cycle: Continuous
 - 7) LED Indicator: On when output is on
 - 8) Approvals: Class 1, Groups A, B, C, D; Class II, Groups E, F, G; Class III, Hazardous
 - 9) Product and Manufacturer: Series ISO as manufactured by Diversified Electronics or approved equal.
 7. Provide uninterruptible power supply (UPS) in pump control panel to provide backup power for PLC, OIT, and barriers.
- H. Back-Up Float Controller:
1. Shall be hardwired to the Lift Station Controller for Float Switch back-up control when pressure transducer fails.
 2. Discrete Input: "High Level", "Start Lag", "Start Lead", "Stop", "Low Level"
 3. Discrete Output: "High Level On", "Pump 2 Called For", "Pump 1 Called For", "Low Level On". These outputs to be hardwired to the Lift Station Controller.
 4. Alarm Outputs: "High Level", "Low Level".
 5. Product and Manufacturer: Healy Ruff Float-Pak Controller
- I. Motor protection:
1. Provide Flygt MiniCas II for seal failure and over temperature alarms for submersible pumps powered and installed in the Pump Control Panel.
 2. Thermal switches:

- a. Stators shall incorporate thermal switches in series to monitor the temperature of each phase winding.
- b. At 125 degrees C (260 degrees F), thermal switch shall open, stop the motor, and activate an alarm.
3. Thermal switches shall be connected to monitoring unit, which is mounted on the inside of the control panel.

J. Submersible Level Transducer

1. General: The submersible level transducer shall be specifically designed to meet rigorous environments encountered in level measurement applications. It shall provide repeatable, precision depth measurements under the most adverse conditions.
2. Required Features:
 - a. Transducer shall incorporate an isolated diaphragm sensor, which is specifically designed for use with hostile fluids and gasses.
 - b. Sensor assembly shall be housed in a rugged 316 SS case that provides for a variety of pressure inputs as well as electrical output connections.
 - c. Static accuracy of +/- 0.2% full scale including linearity, hysteresis and repeatability.
 - d. Temperature range shall be -40 to 185 degrees F.
 - e. Transducer will be certified intrinsically safe for hazardous locations.
 - f. Construction shall be welded 316 SS, convoluted molded Viton diaphragm seal, Buna 'O' ring, neoprene grommet and polyurethane jacketed cable.
 - g. Measurement output shall be 4 -20 mAdc proportional to wet well level.
 - h. Power supply shall be 10-30 Vdc unregulated power.
3. Installation Requirements:
 - a. Transducer shall be provided with enough cable to reach the pump control panel without being spliced.
 - b. The transducer shall be mounted in a location where the cable is easily accessible from the top of the wet well. A stainless steel hook shall be bolted near the top of the wetwell to hold the transducers stainless steel support cable.
4. Model and Manufacturer: Provide submersible level transducer of one of the following:
 - a. Model 6100 as manufactured by Sigma Controls, Inc.
 - b. Or approved equal.
5. Provide transducer dessicant.
6. Transducer cable shall be hung using Kellem Grips or approved equal.

K. Level Switch - Float Type

1. Type: Dual float level probe, freely suspended at required height.
2. Construction Features:
 - a. Float Body: Hollow hermetically sealed, rigidly molded of polypropylene containing mercury switch and eccentric metal weight.

- b. Mercury Switch: Hermetically sealed SPDT switch rated 8 Amps Vac/5 Amps Vdc, cushioned and mounted along main axis at about 65 degree inclination.
 - c. Switch shall operate at intrinsically safe voltage levels.
 - d. Weight: Weight to cause sensor to hang straight down from cable when not immersed and only allow float to pivot when immersed in liquid.
 - e. Electrical Cable:
 - 1) Heavy duty, three conductors, flexible and submersible cable, sheathed in PVC and connected to float and switch with watertight seal.
 - 2) Length furnished to be sufficient to terminate connections at control panel without splicing.
 - 3) A stainless steel cable mounting bracket shall be provided in a convenient location to allow for easy adjustment and removal of float switches.
3. Product and Manufacturer: Provide float type level switch of one of the following:
- a. Model LS100, as manufactured by Flygt.
 - b. Or approved equal.

S 23.25 SHOP TESTING

- A. Provide in accordance with Division 1 Section entitled "Preliminary and Final Field Tests" and as specified herein.
 - 1. Provide motor shop testing in accordance with manufacturer's recommendations.
- B. Pump Tests:
 - 1. Test pump casings under a hydrostatic head of at least 75-psi or 150-percent of rated shutoff head, whichever is greater.
 - 2. Provide certified performance tests as specified herein for all pumps.
 - 3. Certified performance testing.
 - a. Run pump at full speed rating point for 60-minutes prior to start of any testing.
 - b. Full speed test: Test pump as specified conditions and take not less than six (6) operating points between shut-off and run out. Take readings to determine flow, differential pressure, rpm, horsepower, and efficiency. Also, operate each pump for not less than one hour and take readings to determine that the pump will operate as specified and indicated without cavitation at the specified minimum head condition.
 - c. Provide a minimum of 30-days written notice to the Engineer prior to shop testing.

4. Run all tests in accordance with the latest standards of the Hydraulic Institute and as specified.
5. In the event that specified tests indicate that pump or motor, will not meet specifications, Engineer has the right to require additional complete witnessed tests for all pumps and motors at no additional cost to the Owner.
6. Repeat tests until specified results are obtained.
7. Correct or replace promptly all defects or defective equipment revealed by or noted during tests at no additional cost to the Owner.

S 23.26 PAINTING

- A. Primer and Finish Paint: As specified under Division 9, shop apply to all exterior ferrous surfaces manufacturers' standard paint.
 1. Color: As specified for piping system of same service or as selected by the Engineer.
- B. Surface preparation, mixing and application and safety requirements shall be in accordance with the paint manufacturer's printed instructions.
- C. Ferrous surfaces, which are not to be painted, shall be given a shop applied coat of grease or rust resistant coating.

S 23.27 SPARE PARTS

- A. Provide as specified herein.
- B. Provide spare parts that are identical to and interchangeable with similar parts installed.
 1. For each pump:
 - a. One complete set of gaskets.
 2. For each pump station:
 - a. One set of mechanical seals.
 - b. One complete pump with motor.
 3. For each set of pumps of the same size and performance.
 - a. One set of all special tools required.
- C. Spare Parts
 1. Supplier shall provide the following spare parts for each unit.
 - a. Three(3) fuses of each size and type
 - b. Controller spare parts shall be stored inside the controller.

S 23.28 WET WELL AND VALVE VAULT PIPING

- A. Pressure piping and fittings within the wet well and valve pit, to the limits shown on the Contract Drawings, shall be Sch. 80 PVC.
- B. Pipe and fittings shall be manufactured from virgin rigid PVC with a Cell Class of 12454 as identified in ASTM D1784.
- C. PVC Schedule 80 pipe shall be Iron Pipe Size (IPS) conforming to ASTM D1785.
- D. PVC Schedule 80 fittings shall conform to ASTM D2467.
- E. Joints and Fittings: Solvent, socket-weld coupling. Provide flanges only where indicated or required for connections to valves and equipment.
- F. Gaskets: full-face suitable for service specified and indicated.
- G. Solvent: ASTM D 2564.
- H. Solvent Cement: ASTM D 2564.
- I. Screwed Connections: Not acceptable
- J. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer.
- K. Flanged joints shall be joined with suitable gaskets compatible with the material being carried by the pipes, and bolts and nuts shall be stainless steel. Fittings shall be of the same material and shall withstand the same pressures as the pipe.
- L. Shop Painting: Surface preparation, mixing and application and safety requirements shall be in accordance with the paint manufacturer's printed instructions.
- M. Field Painting: Furnished and applied by painting subcontractor.

PART 3 - EXECUTION

S 23.29 INSTALLATION

- A. Install items in accordance with manufacturer's printed instructions, as indicated and specified.
- B. Wet Well and Valve Vault Pipe Installation
 - 1. Install items in accordance with manufacturer's printed instructions and as indicated and specified and in accordance with ASTM D2774.

2. Ensure interior lines parallel to building walls wherever possible. Install piping to accurate lines and grades, and support. Provide pipe supports as required. Where temporary supports are used, ensure rigidity, to prevent shifting or distortion of pipe. Provide for expansion.
3. Support piping laid in trenches in trench on bed of selected backfill material which maintains desired line and grade.
4. Trenches should be backfilled immediately after the pipe has been laid.
5. Pitch all piping toward low points. Provide for draining low points.
6. Before assembly, remove all dirt and chips from inside pipe and fittings.
7. Use dielectric bushings or unions when ferrous pipes join nonferrous pipes carrying liquid either underground or elsewhere.
8. Welding in accordance with AN Standard B31 and AWS B3.0.
9. Provide concrete thrust blocking at all tees and bends.

C. Temporary Plugs

1. Close open ends of pipe with temporary plugs or caps when pipe installation is not in progress. Use watertight plugs for exterior, buried piping and if water or debris is in trench when work is resumed, do not remove until adequate provision has been made to prevent any water or debris entering pipe even if it necessitates dewatering trench.

S 23.30 FIELD TESTING

- A. Provide in accordance with Division 1 Section "Preliminary and Final Field Tests" and as specified herein.
- B. Test piping connections to prove the pump nozzles are installed with the pipe in a free supported state and without need to apply vertical or horizontal pressure to align piping with pump nozzles.
- C. After installation of pumping equipment and after inspection, operation, testing and adjustment have been completed by manufacturer's field service technician, conduct running test for each pump in the presence of the Engineer to determine its ability to operate within the vibration and temperature limits specified, and to deliver its rated capacity under specified conditions. During tests, observe and record head, capacity, motor power factor, noise and vibration. Immediately correct or replace all defects or defective equipment revealed by or noted during tests, at no additional cost to the Owner, and repeat tests until specified results and results acceptable to the Engineer are obtained. Contractor to provide all labor, piping, equipment, flow meters, test gauges, vibration testing equipment and materials for conducting tests.

1. Provide vibration signature test data for each pump and drive assembly.
 - a. Limit: In accordance with Hydraulic Institute Standards.
 2. Test Duration: Determined by the Engineer, but not less than 3-hours of continuous operation at each condition specified and indicated.
- D. Make all adjustments necessary to place equipment in specified working order at time of above tests.
- E. Remove and replace equipment at no additional cost to the Owner with equipment that will meet all requirements specified and indicated if unable to demonstrate to the satisfaction of the Engineer that equipment will perform the service specified, indicated and as submitted and approved.

S 23.31 WET WELL AND VALVE VAULT PIPE TESTING

- A. After installation, test all pipelines for watertightness. Furnish testing plugs or caps, pressure pumps, pipe connections, gauges, all equipment, all labor, and all water.
- B. Do not cover joints in underground piping with backfill material until piping has successfully passed pressure test.
- C. Testing shall be in accordance with ASTM D2241 and ASTM D3139.
- D. Repair faulty joints even to extent of disassembling and remaking joint, remove defective pipe and fittings and replace in manner satisfactory to the Owner.
- E. Wet Well and Valve Vault Piping Testing Procedure:
1. Contractor shall furnish all testing equipment, including but not limited to, water, pump(s), gauges, and necessary fittings, at no additional cost to the Owner.
 2. The duration of each test shall be no less than four (4) hours.
 3. Force mains shall be tested under a constant hydrostatic pressure of 75 psi.
 4. Leakage in force mains shall not exceed 2-1/2 gph per inch of internal diameter per mile of pipe.
 5. All visual leaks shall be made tight.
 6. Tests shall be repeated until the results are satisfactory.
 7. The Engineer shall be notified a minimum of five (5) days in advance of the time the test is to be made. No test shall be accepted unless witnessed by the Authority's Engineer or his authorized representative.

S 23.32 OPERATION AND MAINTENANCE MANUALS

- A. Supplier shall provide Operation and Maintenance Manuals as specified in Division 1 Section "Operations and Maintenance Manuals and Data." The manuals shall include equipment descriptions, operating instructions, drawings, troubleshooting techniques, a recommended maintenance schedule, and the recommended lubricants.

S 23.33 FIELD TOUCH-UP PAINTING

- A. After installation and approved testing by the Engineer. Contractor shall apply touch-up paint to all scratched, abraded and damaged shop painted surfaces. Coating type and color shall match shop painting.

I/O LIST

Description	Input From
High Meadow Carriage Homes Pump Station	
Analog Inputs	
Wet Well Level	Submersible Level Transmitter/Pump Control Panel
Discrete Inputs	
Pump No. 1 Run	Pump Control Panel
Pump No. 1 Failure	Pump Control Panel
Pump No. 1 Seal Failure	Pump Control Panel
Pump No. 1 Over Temperature	Pump Control Panel
Pump No. 2 Run	Pump Control Panel
Pump No. 2 Failure	Pump Control Panel
Pump No. 2 Seal Failure	Pump Control Panel
Pump No. 2 Over Temperature	Pump Control Panel
Phase Monitor – Normal Power Loss	Pump Control Panel
Wet Well Low-Low level	Low-low Level Float Switch/Pump Control Panel
Wet Well High-High level	High-high Level Float Switch/Pump Control Panel
Discrete Outputs	
Output To	
Pump No. 1 Running	Mission Controls System
Pump No. 1 Alarm (Over-temperature, Seal Failure, Failure)	Mission Controls System
Pump No. 2 Running	Mission Controls System
Pump No. 2 Alarm (Over-temperature, Seal Failure, Failure)	Mission Controls System
Normal Power Loss	Mission Controls System
Wet Well High-High Level	Mission Controls System
Wet Well Low-Low Level	Mission Controls System
Generator Running	Mission Controls System
Generator Fail	Mission Controls System
ATS in Emergency	Mission Controls System

END OF SECTION S-23

ELECTRICAL SPECIFICATIONS

SECTION 260001 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following:
 - 1. Electrical equipment coordination and installation.
 - 2. Common electrical installation requirements.

1.2 DEFINITIONS

- A. ATS: Acceptance Testing Specifications.

1.3 QUALITY ASSURANCE

- A. Test Equipment Suitability and Calibration: Comply with NETA ATS, "Suitability of Test Equipment" and "Test Instrument Calibration."

1.4 DELIVERY, STORAGE, AND HANDLING

1.5 FIELD CONDITIONS

- A. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, , with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for underground piping to verify actual locations of piping connections before equipment installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until equipment is ready to be energized and placed into service.

- B. Replace equipment whose interiors have been exposed to a buildup of dust or debris, water or other liquids prior to Substantial Completion.

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 MAINTENANCE SERVICE

- A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include annual preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacture's authorized replacement parts and supplies.

END OF SECTION 260001

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.

1.2 DEFINITIONS

A. RoHS: Restriction of Hazardous Substances.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Okonite Company (The).
2. Service Wire Co.

3. Southwire Company, LLC.
4. Approved Equal.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

E. Conductor Insulation:

1. Type XHHW-2: Comply with UL 44.

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. 3M Electrical Products.
2. ABB, Electrification Business.
3. Hubbell Utility Solutions; Hubbell Incorporated.
4. Approved Equal.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: One hole with standard barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type XHHW-2, single conductors in raceway.
- B. Exposed Feeders: Type XHHW-2, single conductors in raceway.
- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.
- D. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- E. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.
- F. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."
- G. Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
 - 2. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors feeding the following critical equipment and services for compliance with requirements:
 - 3. Perform each of the following visual and electrical tests:
 - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
 - b. Test bolted connections for high resistance using one of the following:
 - 1) A low-resistance ohmmeter.
 - 2) Calibrated torque wrench.
 - 3) Thermographic survey.
 - c. Inspect compression-applied connectors for correct cable match and indentation.
 - d. Inspect for correct identification.
 - e. Inspect cable jacket and condition.
 - f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
 - g. Continuity test on each conductor and cable.
 - h. Uniform resistance of parallel conductors.
- B. Cables will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports to record the following:
 - 1. Procedures used.
 - 2. Results that comply with requirements.
 - 3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Low-voltage control cabling.
 - 2. Control-circuit conductors.
 - 3. Identification products.

1.2 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Source quality-control reports.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. RoHS compliant.

2.2 LOW-VOLTAGE CONTROL CABLE

- A. Description: Shielded Twisted Pair (STP) cables shall be used for all analog signal wiring installed under this contract.

- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Belden Electronic Wire and Cable Company.
 - 2. General Cable; Prysmian Group North America.
 - 3. Okonite Company.
 - 4. Approved Equal.

- C. Paired Cable: NFPA 70, Type CMG.
 - 1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
 - 2. PVC insulation, 600 V.
 - 3. Cable shield shall be aluminum-polyester tape overlapped to provide 100% coverage, and a 7 strand tinned copper drain wire, size 18 AWG.
 - 4. PVC jacket, 80 C temperature rating.
 - 5. Flame Resistance: Comply with UL 1685.

2.3 CONTROL-CIRCUIT CONDUCTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. General Cable; Prysmian Group North America.
 - 2. Service Wire Co.
 - 3. Southwire Company.
 - 4. Approved Equal.

- B. Class 1 Control Circuits: Stranded copper, Type XHHW-2, complying with UL 44 in raceway.

- C. Class 2 Control Circuits: Stranded copper, Type XHHW-2, complying with UL 44 in raceway.

- D. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type XHHW-2, complying with UL 44 in raceway.

2.4 SOURCE QUALITY CONTROL

- A. Factory test twisted pair cables according to TIA-568-C.2.

- B. Cable will be considered defective if it does not pass tests and inspections.

- C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Test cables on receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits.
2. Reject failed cables.

3.2 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
 1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.
 2. Flexible metal conduit shall not be used.
- B. Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.
- C. Install manufactured conduit sweeps and long-radius elbows if possible.
- D. Raceway Installation in Equipment Rooms:
 1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
 2. Install cable trays to route cables if conduits cannot be located in these positions.
 3. Secure conduits to backboard if entering the room from overhead.
 4. Extend conduits 3 inches above finished floor.
 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 1. Comply with TIA-568-C Series of standards.
 2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."
 3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 4. Cables may not be spliced and shall be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points. Make taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 5. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
 6. Furnish a separate raceway system for shielded signal cable. Do not run in the same conduit with power cable.
 7. Where telemetry cables are run in the same duct bank with power cables, use galvanized steel conduit. Use junction boxes and "LB" fittings in manholes to maintain a continuous steel raceway system for signal cables.

8. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.
10. Install exposed cables parallel and perpendicular to surfaces or exposed structural members and follow surface contours where possible.
11. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
12. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
13. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
14. Support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals. Do not allow cables to lie on removable ceiling tiles.
15. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
16. Provide strain relief.
17. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
18. Ground wire shall be copper, and grounding methods shall comply with IEEE C2. Demonstrate ground resistance.

C. Installation of Control-Circuit Conductors:

1. Install wiring in raceways.
2. Use insulated spade lugs for wire and cable connection to screw terminals.
3. Comply with requirements specified in Section 260533 "Raceways and Boxes for Electrical Systems."
4. Control wiring may be pulled in the power conduits and wireways providing the highest voltage of the adjacent wires is not more than 120 volts.

D. Power Control Systems

1. The wiring of this category (single conductor, or multiple conductor) is to be installed in accordance with the NEC.

E. Telemetry and Instrumentation Signal Systems

1. Separate conduit and wireway runs are required for this category. All wiring is to be isolated from all power systems.

3.4 REMOVAL OF CONDUCTORS AND CABLES

- A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified with a tag for future use.

3.5 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits; No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.6 GROUNDING

A. For data communication wiring, comply with TIA-607-B and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.

1. Ground cable shield at termination of instrumentation cabinet only. Ground connection should be visible.

B. For low-voltage control wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 IDENTIFICATION

A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Identify data and communications system components, wiring, and cabling according to TIA-606-B; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.

C. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire shall have a unique tag.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. General Tests and Inspections:

1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination, but not after cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in its "Test Instruments (Normative)" Annex, complying with measurement accuracy specified

in its "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

- C. Retest and inspect cabling to determine compliance of replaced or additional work with specified requirements.
- D. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace cabling where test results indicate that they do not comply with specified requirements. Retest until satisfactory.
- F. Prepare test and inspection reports.

END OF SECTION 260523

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Ground rods.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data,"include the following:
 - a. Plans showing as-built, dimensioned locations of system described in "Field Quality Control" Article, including the following:
 - 1) Ground rods.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. ABB (Electrification Products Division).
 - 2. Advanced Lightning Technology, Ltd.
 - 3. Siemens Industry, Inc., Energy Management Division.
 - 4. Approved Equal.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B3.
 - 2. Stranded Conductors: ASTM B8.
 - 3. Tinned Conductors: ASTM B33.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Conduit Hubs: Mechanical type, terminal with threaded hub.
- D. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- E. Straps: Solid copper, cast-bronze clamp or copper lugs. Rated for 600 A.
- F. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
- G. Water Pipe Clamps:

1. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 12 AWG and smaller, and stranded conductors for No. 10 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.
 1. Bury at least 30 inches below grade.
- C. Grounding Conductors: Green-colored insulation with continuous yellow stripe.
- D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- E. Conductor Terminations and Connections:
 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper

conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.4 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.

3.5 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. Use exothermic welds for all below-grade connections.
 - 3. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.
 - 1. Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.

- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 - 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
 - 5. Manhole Grounds: 10 ohms.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Slotted support systems, hardware, and accessories.
 - b. Clamps.
 - c. Hangers.
 - d. Sockets.
 - e. Eye nuts.
 - f. Fasteners.
 - g. Anchors.
 - h. Saddles.
 - i. Brackets.
2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.

1.3 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M.
2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch diameter holes at a maximum of 8 inches o.c. in at least one surface.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper B-Line, Inc.; a division of Cooper Industries.
 - b. Thomas & Betts Corporation.
 - c. Unistrut; Tyco International, Ltd.
 - d. Approved equal.
 - 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 - 3. Material for Channel, Fittings, and Accessories: Galvanized steel.
 - 4. Channel Width: Selected for applicable load criteria.
 - 5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 - 6) Approved Equal.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325 (Grade A325M).
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 1. NECA 1.
 2. NECA 101
- B. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with single-bolt conduit clamps.
- E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT IMC and RMC may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To New Concrete: Bolt to concrete inserts.
 - 2. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 3. To Existing Concrete: Expansion anchor fasteners.
 - 4. To Light Steel: Sheet metal screws.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Anchor equipment to concrete base as follows:
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

1.2 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. EMT: Electrical metallic tubing.
- D. ENT: Electrical nonmetallic tubing.
- E. FMC: Flexible metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.

1.3 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

- A. Metal Conduit:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit; a Tyco International Ltd. Co.
 - b. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - c. Wheatland Tube Company.
 - d. Approved equal.
2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. GRC: Comply with ANSI C80.1 and UL 6.
4. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
 - a. Comply with NEMA RN 1.
 - b. Coating Thickness: 0.040 inch, minimum.
5. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit; a Tyco International Ltd. Co.
 - b. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - c. Wheatland Tube Company.
 - d. Approved equal.
2. Comply with NEMA FB 1 and UL 514B.
3. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
4. Fittings, General: Listed and labeled for type of conduit, location, and use.
5. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

- C. Joint Compound for GRC or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

- A. Nonmetallic Conduit:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AFC Cable Systems, Inc.
 - b. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - c. Arnco Corporation.
 - d. CANTEX Inc.
 - e. CertainTeed Corp.; Pipe & Plastics Group.
 - f. Condux International, Inc.
 - g. ElecSYS, Inc.
 - h. Electri-Flex Co.
 - i. Lamson & Sessions; Carlon Electrical Products.
 - j. Manhattan/CDT/Cole-Flex.
 - k. RACO; a Hubbell Company.
 - l. Thomas & Betts Corporation
 - m. Approved equal.
2. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

B. Nonmetallic Fittings:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AFC Cable Systems, Inc.
 - b. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - c. Arnco Corporation.
 - d. CANTEX Inc.
 - e. CertainTeed Corp.; Pipe & Plastics Group.
 - f. Condux International, Inc.
 - g. ElecSYS, Inc.
 - h. Electri-Flex Co.
 - i. Lamson & Sessions; Carlon Electrical Products.
 - j. Manhattan/CDT/Cole-Flex.
 - k. RACO; a Hubbell Company.
 - l. Thomas & Betts Corporation
 - m. Approved equal.
2. Fittings, General: Listed and labeled for type of conduit, location, and use.
3. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
4. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman.
 - 3. Square D; Schneider Electric.
 - 4. Approved equal.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 - 2. EGS/Appleton Electric.
 - 3. Hoffman.
 - 4. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
 - 5. O-Z/Gedney; a unit of General Signal.
 - 6. RACO; a Hubbell Company.
 - 7. Robroy Industries, Inc.; Enclosure Division.
 - 8. Thomas & Betts Corporation..
 - 9. Approved equal.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum or galvanized, cast iron with gasketed cover.

- G. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- H. Device Box Dimensions: As required.
- I. Gangable boxes are prohibited.
- J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: UV resistant Plastic or Fiberglass.
 - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- K. Cabinets:
 - 1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.
 - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
 - 1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
 - 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed Conduit: GRC.
 - 2. Underground Conduit, Direct Buried: PVC-coated rigid steel conduit.
 - 3. Underground Conduit, Concrete Encased: RNC.
 - 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X, 316 stainless steel.
- B. Minimum Raceway Size:
 - 1. Direct buried: 1-inch trade size.
 - 2. Concrete encased ductbank: 2-inch trade size.

3. All other applications: 3/4-inch trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- E. Install surface raceways only where indicated on Drawings.
- F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.
- D. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- E. Complete raceway installation before starting conductor installation.
- F. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- G. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- H. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- I. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- J. Support conduit within 12 inches of enclosures to which attached.

- K. Raceways Embedded in Slabs:
1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
 4. Do not embed threadless fittings in concrete unless specifically approved by Engineer for each specific location.
- L. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- M. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- N. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- O. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- P. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- Q. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- R. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- S. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
1. Where an underground service raceway enters a building or structure.
 2. Conduit extending from interior to exterior of building.
 3. Conduit extending into pressurized duct and equipment.
 4. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
 5. Where otherwise required by NFPA 70.
- U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

V. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.

X. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Y. Locate boxes so that cover or plate will not span different building finishes.

Z. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

AA. Fasten junction and pull boxes to or support from structure. Do not support boxes by conduits.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to

provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."

4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
5. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits but a minimum of 6 inches below grade. Align planks along centerline of conduit.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install handholes with bottom below frost line.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.
- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- C. Rectangular Sleeve Minimum Metal Thickness:
 1. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
 2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.

- D. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed.
- E. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

3.6 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground, exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Labels.
2. Bands and tubes.
3. Tapes and stencils.
4. Tags.
5. Signs.
6. Cable ties.
7. Miscellaneous identification products.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
2. Colors for 208/240/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.

- 1) If one phase is at a higher voltage than the others, using a “high-leg” connection: Orange (in compliance with NEC articles 110.15 and 408.3)
 - c. Phase C: Blue.
 - 3. Colors for 240-V, single phase Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - 4. Color for Neutral: White.
 - 5. Color for Equipment Grounds: Bare copper, Green, or Green with a yellow stripe.
 - 6. Colors for Isolated Grounds: Green with two or more yellow stripes.
- C. Raceways and Cables Carrying Circuits at More Than 600 V:
- 1. Black letters on an orange field.
 - 2. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."
- D. Warning Label Colors:
- 1. Identify system voltage with black letters on an orange background.
- E. Warning labels and signs shall include, but are not limited to, the following legends:
- 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
- F. Equipment Identification Labels:
- 1. Black letters on a white field.

2.2 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
- B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.
- C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil thick, polyester flexible label with acrylic pressure-sensitive adhesive.
 - 1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
 - 2. Marker for Labels:
 - a. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Polyester or vinyl, thermal, transfer-printed, 3-mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

- a. 1-1/2 by 6 inches for raceway and conductors.
- b. 3-1/2 by 5 inches for equipment.
- c. As required by authorities having jurisdiction.

2.3 TAGS

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

2.4 SIGNS

A. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:
 - a. For signs up to 20 sq. in., minimum 1/16 inch thick.
 - b. For signs larger than 20 sq. in., 1/8 inch thick.
 - c. Engraved legend with black letters on white face.
 - d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.
 - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.5 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- I. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch high letters for emergency instructions at equipment used for power transfer or load shedding.

- J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- K. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. "EMERGENCY POWER."
 - 2. "POWER."
 - 3. "UPS."
- L. Vinyl Wraparound Labels:
 - 1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
 - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- M. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.
- N. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.
- O. Self-Adhesive Labels:
 - 1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.
- P. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.
- Q. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.
- R. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
 - 1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- S. Underground Line Warning Tape:
 - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
 - 2. Install underground-line warning tape for direct-buried cables and cables in raceways.
- T. Metal Tags:
 - 1. Place in a location with high visibility and accessibility.

2. Secure using UV-stabilized cable ties.
- U. Nonmetallic Preprinted Tags:
1. Place in a location with high visibility and accessibility.
 2. Secure using UV-stabilized cable ties.
- V. Write-on Tags:
1. Place in a location with high visibility and accessibility.
 2. Secure using UV-stabilized cable ties.
- W. Laminated Acrylic or Melamine Plastic Signs:
1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high sign; where two lines of text are required, use labels 2 inches high.
- X. Cable Ties: General purpose, for attaching tags, except as listed below:
1. Outdoors: UV-stabilized nylon.

3.3 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels or vinyl tape applied in bands.
1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels, self-adhesive wraparound labels, snap-around labels, snap-around color-coding bands, or self-adhesive vinyl tape to identify the phase.
1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- E. Power-Circuit Conductor Identification, More Than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic preprinted tags colored and marked to indicate phase, and a separate tag with the circuit designation.

- F. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.
- G. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with the conductor designation.
- H. Auxiliary Electrical Systems Conductor Identification: Marker tape or Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
- I. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- J. Concealed Raceways and Duct Banks, More Than 600 V, within Buildings: Apply floor marking tape to the following finished surfaces:
 - 1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.
 - 2. Wall surfaces directly external to raceways concealed within wall.
 - 3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.
- K. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- L. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.
 - 1. Apply to exterior of door, cover, or other access.
 - 2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
 - a. Power-transfer switches.
 - b. Controls with external control power connections.
- M. Arc Flash Warning Labeling: Self-adhesive labels.
- N. Operating Instruction Signs: Self-adhesive labels.
- O. Emergency Operating Instruction Signs: Self-adhesive labels with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer or load shedding.
- P. Equipment Identification Labels:
 - 1. Outdoor Equipment: Laminated acrylic or melamine sign.
 - 2. Equipment to Be Labeled:

- a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label.
- b. Enclosures and electrical cabinets.
- c. Access doors and panels for concealed electrical items.
- d. Enclosed switches.
- e. Enclosed circuit breakers.
- f. Enclosed controllers.
- g. Push-button stations.
- h. Power-transfer equipment.
- i. Contactors.
- j. Remote-controlled switches, dimmer modules, and control devices.
- k. Monitoring and control equipment.
- l. UPS equipment.

END OF SECTION 260553

SECTION 260800 - HEAT TRACING AND INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes plumbing piping heat tracing for freeze prevention, domestic hot-water-temperature maintenance, and snow and ice melting on roofs and in gutters and downspouts with the following electric heating cables:
 - 1. Self-regulating, parallel resistance.
 - 2. Piping Insulation

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
 - 2. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.
 - 3. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For electric heating cables to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Raychem model 5BVT1-CT or comparable product by one of the following:
 - 1. Raychem.
 - 2. Thermon Inc.
 - 3. OMEGA Engineering Inc.
- B. Comply with IEEE 515.1.
- C. Heating Element: Pair of parallel No. 16 AWG, tinned copper braid wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled, nonheating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating.
- D. Electrical Insulating Jacket: Flame-retardant polyolefin.
- E. Cable Cover: Fluoropolymer corrosion resistant overjacket over braid for hostile/corrosive environments.
- F. Maximum Operating Temperature (Power On): 40 deg F.
- G. Maximum Exposure Temperature (Power Off): 55 deg F.
- H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- I. Capacities and Characteristics:
 - 1. Maximum Heat Output: 5 Watts/ft.
 - 2. Piping Diameter: 1-1/2" Force main in 4" carrier pipe.
 - 3. Number of Parallel Cables: 2.
 - 4. Electrical Characteristics for Single-Circuit Connection:
 - a. Volts: 120.
 - b. Phase: 1.
 - c. Hertz: 60.
 - d. Maximum Overcurrent Protection (EPD-Type): 30.
 - 5. Rated for Class I, Division II locations.

2.2 INSULATION

- A. Fiberglass Pipe Insulation
 - 1. The fiberglass insulation shall be used for valves, fittings and pipes above grade down to one foot above grade.

2. The fiberglass insulation shall be 6 lb. density, with a minimum "K" of 0.22 at 75 degrees F. mean temperature.
3. For all piping up to and including two (2) inch diameter the minimum nominal thickness shall be one (1) inch.
4. For all piping over two (2) inch diameter the minimum thickness shall be two (2) inches.
5. The insulation shall be SSL-II fiberglass with all service jacket and double adhesive self sealing lap for positive vapor seal as manufactured by Owens-Corning or equal.

B. Cellular Glass Pipe Insulation

1. The cellular glass insulation shall be used from one (1) foot above grade down to four (4) feet below grade for pipe carrying liquids.
2. The cellular glass insulation shall be a rigid, non-absorptive type with a compressive strength of 100 pounds per square inch.
3. The thickness of insulation shall be the same as specified for fiberglass pipe insulation above.
4. The insulation shall be "Foamglas" as manufactured by Pittsburgh Corning Corp. or equal.

C. ALUMINUM JACKET

1. All insulation shall be covered with a corrugated aluminum jacket. The aluminum jackets shall have corrugations 3/16 inch deep, a metal thickness of 0.016 inches, and a 3 mil thick polysurlyn liner as a moisture barrier.
2. Jacket shall be as manufactured by ITW or equal.

2.3 ACCESSORIES

- A. Cable Installation Accessories: Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.
- B. Ambient-sensing thermostat power connection kit.
- C. Signal light kit.
- D. Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least 3 mils thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.
 1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.
 2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Install the following types of electric heating cable for the applications described:
 - 1. Pipe Freeze Protection: Self-regulating, parallel-resistance heating cable.

3.3 INSTALLATION

- A. Install electric heating cable across expansion, construction, and control joints according to manufacturer's written instructions; use cable-protection conduit and slack cable to allow movement without damage to cable.
- B. Electric Heating-Cable Installation for Freeze Protection for Piping:
 - 1. Install electric heating cables after piping has been tested and before insulation is installed.
 - 2. Install electric heating cables according to IEEE 515.1.
 - 3. Install insulation over piping with electric cables.
 - 4. Install warning tape on piping insulation where piping is equipped with electric heating cables.
- C. Set field-adjustable switches and circuit-breaker trip ranges.

3.4 ALUMINUM JACKET COVER

- A. Cover shall be lapped 3 inches at all joints with the lap in the 4 o'clock position to shed water. All laps shall be sealed with Foster 60-25, Childers CP-70, or equal.
- B. The cover shall be held in place by stainless steel bands on 12 inch centers or loops of stainless steel wire spaced on 8 inch centers. Nothing shall be allowed to pierce the jacket at any point. Outdoor fittings, valves and flanges shall be weatherproofed. Over the base finish apply two (2) coats of Foster's 36-10/46-10 Weatherite Mastic or Childers CP-10/CP-11 mastic according to manufacturer's application guidelines. Where aluminum jackets are used, apply bumped ells of fabricated 16 mil aluminum, banded in place and weatherproofed.

3.5 PIPING ACCESSORIES

- A. Insulation on strainers, valves and other piping accessories that normally require access shall be installed with removable covers.

3.6 CONNECTIONS

- A. Ground equipment according to the latest edition of the National Electric Code.

3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Perform tests after cable installation but before application of coverings such as insulation, wall or ceiling construction, or concrete.
 - 2. Test cables for electrical continuity and insulation integrity before energizing.
 - 3. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.
- B. Repeat tests for continuity, insulation resistance, and input power after applying thermal insulation on pipe-mounted cables.
- C. Cables will be considered defective if they do not pass tests and inspections.

3.8 PROTECTION

- A. Protect installed heating cables, including nonheating leads, from damage during construction.
- B. Remove and replace damaged heat-tracing cables.

END OF SECTION 260800

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Load centers.

B. Related Requirements

1. Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits" for external SPDs for Panelboards.

1.2 DEFINITIONS

- A. AFCI: Arc-fault circuit interrupter.
- B. ATS: Acceptance testing specification.
- C. GFCI: Ground-fault circuit interrupter.
- D. GFEP: Ground-fault equipment protection.
- E. HID: High-intensity discharge.
- F. MCCB: Molded-case circuit breaker.
- G. SPD: Surge protective device.
- H. VPR: Voltage protection ratings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.

3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Key interlock scheme drawing and sequence of operations.
9. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

1.4 INFORMATIONAL SUBMITTALS

- A. Panelboard Schedules: For installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

- A. Field Quality-Control Reports:
 1. Test procedures used.
 2. Test results that comply with requirements.
 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- B. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Keys: Two spares for each type of panelboard cabinet lock.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: ISO 9001 or ISO 9002 certified.
- B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.9 FIELD CONDITIONS

- A. Environmental Limitations:
 - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
 - b. Altitude: Not exceeding 6600 feet.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
 - 1. Ambient temperatures within limits specified.
 - 2. Altitude not exceeding 6600 feet.

1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
 - 1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Eaton Corporation, Inc. (Eaton)
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution. (GE)
 - 3. Siemens Energy & Automation, Inc. (Siemens)
 - 4. Square D; a brand of Schneider Electric. (Square D)
 - 5. Approved equal.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.
- E. Enclosures: Surface-mounted, dead-front cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations, Wash-Down and Process Areas and other Wet or Damp Indoor Locations: NEMA 250, Type 4X, stainless steel.
 - 2. Height: 84 inches maximum.
 - 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
 - 4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
 - 5. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel.
- F. Incoming Mains:
 - 1. Location: Convertible between top and bottom.
 - 2. Main Breaker: Main lug interiors up to 100 amperes shall be field convertible to main breaker.
- G. Phase, Neutral, and Ground Buses:
 - 1. Material: Tin-plated aluminum.
 - a. Plating shall run entire length of bus.
 - b. Bus shall be fully rated the entire length.
 - 2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
 - 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
 - 4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
- H. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Tin-plated aluminum.
 - 2. Terminations shall allow use of 75 deg C rated conductors without derating.

3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
 1. Main and Neutral Lugs: Compression type, with a lug on the neutral bar for each pole in the panelboard.
 2. Ground Lugs and Bus-Configured Terminators: Compression type, with a lug on the bar for each pole in the panelboard.
 3. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 4. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.
- I. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
1. Percentage of Future Space Capacity: 10 percent.
- J. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include label or manual with size and type of allowable upstream and branch devices listed and labeled by an NRTL for series-connected short-circuit rating.
1. Panelboards rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.

2.2 PERFORMANCE REQUIREMENTS

- A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

2.3 LOAD CENTERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
1. Eaton
 2. GE
 3. Siemens
 4. Square D
 5. Approved equal.
- B. Load Centers: Comply with UL 67.
- C. Mains: Circuit breaker.
- D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges secured with flush latch with tumbler lock; keyed alike.
- F. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Single Source: Obtain protective devices from same manufacturer of panelboards.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Ground-Fault Circuit Interrupter (GFCI) Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
 - 3. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 - 4. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.
 - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
 - f. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.
 - g. Multipole units enclosed in a single housing with a single handle.
 - h. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
 - i. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.5 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
 - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA 1.
- C. Install panelboards and accessories according to NEMA PB 1.1.
- D. Equipment Mounting:
 - 1. Attach floor-mounted panelboards to the vertical finished or structural surface behind the panelboard in the same manner as a surface-mounted panelboard.
 - 2. Mount surface-mounted panelboards to steel slotted supports 1-1/4 inch in depth. Orient steel slotted supports vertically.
- E. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- F. Mount panelboard cabinet plumb and rigid without distortion of box.
- G. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
 - 2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- H. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

- I. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- J. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Submit for approval before installing. Handwritten directories are not acceptable. Install approved directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with NEC Article 408.4 and requirements for identification specified in Section 260553 "Identification for Electrical Systems."
 - 1. Include the following information:
 - a. Equipment name or identifier
 - b. System voltage and phase
 - c. Source of supply
- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Perform optional tests. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

3.6 PROTECTION

- A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. GFCI receptacles, 125 V, 20 A.
 - 2. Cord and plug sets.
 - 3. Wall plates.
- B. Related Requirements:
 - 1. Section 260523 "Control-Voltage Electrical Power Cables" for communication cable wall plates and jacks.

1.2 DEFINITIONS

- A. AFCI: Arc-fault circuit interrupter.
- B. BAS: Building automation system.
- C. EMI: Electromagnetic interference.
- D. GFCI: Ground-fault circuit interrupter.
- E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- F. RFI: Radio-frequency interference.
- G. SPD: Surge protective device.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Eaton's Arrow Heart. (Arrow Heart).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).
 - 5. Approved equal.
- B. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- C. Comply with NFPA 70.
- D. RoHS compliant.
- E. Comply with NEMA WD 1.
- F. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with requirements in this Section.
 - 3. Receptacles: Match plug configurations.
 - 4. Cord and Plug Sets: Match equipment requirements.
- G. Device Color:
 - 1. Wiring device catalog numbers in Section Text do not designate device color.
 - 2. Wiring Devices Connected to Normal Power System, unless otherwise indicated or required by NFPA 70 or device listing:
 - a. Process areas: Black
 - 3. Wiring Devices Connected to Essential Electrical System: Red.
 - 4. SPD Devices: Blue.
- H. Wall Plate Color: For plastic covers, match device color.
- I. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GFCI RECEPTACLES, 125 V, 20 A

- A. Duplex GFCI Receptacles, 125 V, 20 A (GFCI):

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; GF20.
 - b. Pass & Seymour; 2084.
 - c. Leviton G5362-_.
 - d. Approved equal.
2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Type: Feed through.
5. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

2.3 CORD AND PLUG SETS

- A. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
- B. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
- C. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.4 WALL PLATES

- A. Single Source: Obtain wall plates from same manufacturer of wiring devices.
- B. Single and combination types shall match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces: Steel with white baked enamel, suitable for field painting.
 3. Material for Unfinished Spaces: Galvanized steel.
 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes, and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall comply with NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailling existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction or that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 GFCI RECEPTACLES

- A. Install non-feed-through GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

- A. Test Instruments: Use instruments that comply with UL 1436.
- B. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- C. Perform tests and inspections.
- D. Tests for Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault-current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- E. Wiring device will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports. Organize results by building and by room.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Molded-case circuit breakers (MCCBs).
 - 2. Enclosures.

1.2 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - 5. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.
- B. Shop Drawings: For enclosed switches and circuit breakers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include wiring diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.
 - 1. Include the following:
 - a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 - b. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with NFPA 70.

2.2 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ABB, Electrification Business.
 - 2. Eaton.
 - 3. Siemens Industry, Inc., Energy Management Division.
 - 4. Square D; Schneider Electric USA.
 - 5. Approved Equal.
- B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
- C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located

on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

- D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker.
- E. MCCBs shall be equipped with a device for locking in the isolated position.
- F. Lugs shall be suitable for 140 deg F (60 deg C) rated wire on 125-A circuit breakers and below.
- G. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.
- H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- I. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- J. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 - 1. Instantaneous trip.
 - 2. Long- and short-time pickup levels.
 - 3. Long- and short-time time adjustments.
 - 4. Ground-fault pickup level, time delay, and I-squared t response.
- K. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- L. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
- M. Ground-Fault Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- N. Ground-Fault Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- O. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.

2.3 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

- B. Enclosure Finish: The enclosure shall be finished with a brush finish on Type 304 stainless steel (NEMA 250 Type 4-4X stainless steel).
- C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.
- D. Operating Mechanism: The circuit-breaker operating handle shall be directly operable through the dead front trim of the enclosure (NEMA 250 Type 3R). The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.
- E. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.
- F. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 4X.
 - 3. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 - 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
 - 6. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7 with cover attached by Type 316 stainless steel bolts.

3.3 INSTALLATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Comply with NFPA 70 and NECA 1.

3.4 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections for Switches:
 - 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, grounding, and clearances.
 - c. Verify that the unit is clean.
 - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
 - e. Verify that fuse sizes and types match the Specifications and Drawings.
 - f. Verify that each fuse has adequate mechanical support and contact integrity.
 - g. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

- a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
 - h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
 - i. Verify correct phase barrier installation.
 - j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.
2. Electrical Tests:
- a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
 - b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
 - c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
 - d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
 - e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

C. Tests and Inspections for Molded Case Circuit Breakers:

1. Visual and Mechanical Inspection:

- a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
- b. Inspect physical and mechanical condition.
- c. Inspect anchorage, alignment, grounding, and clearances.
- d. Verify that the unit is clean.
- e. Operate the circuit breaker to ensure smooth operation.
- f. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

- 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
 - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
- g. Inspect operating mechanism, contacts, and chutes in unsealed units.
- h. Perform adjustments for final protective device settings in accordance with the coordination study.

2. Electrical Tests:

- a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
- b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
- c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
- d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
- e. Determine the following by primary current injection:
 - 1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.
- f. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.

SECTION 263600 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nonautomatic transfer switches.
2. Transfer switch accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for transfer switches.
2. Include rated capacities, operating characteristics, electrical characteristics, and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
2. Include material lists for each switch specified.
3. Single-Line Diagram: Show connections between transfer switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.
4. Riser Diagram: Show interconnection wiring between transfer switches, bypass/isolation switches, annunciators, and control panels.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer-authorized service representative.
- B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.
 1. Include the following:
 - a. Features and operating sequences, both automatic and manual.

- b. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications:

- 1. Member company of NETA.
 - a. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.6 FIELD CONDITIONS

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.

- 1. Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA ICS 1.
- C. Comply with NFPA 99.
- D. Comply with NFPA 110.
- E. Comply with UL 1008 unless requirements of these Specifications are stricter.
- F. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.
- G. Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.
 - 1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.
 - 2. Short-time withstand capability for three cycles.

- H. Repetitive Accuracy of Solid-State Controls: All settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.
- I. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- J. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism. Switches for emergency or standby purposes shall be mechanically and electrically interlocked in both directions to prevent simultaneous connection to both power sources unless closed transition.
 - 1. Ground-Fault Protection: Comply with UL 1008 for normal bus.
 - 2. Service Disconnecting Means: Externally operated, manual mechanically actuated.
- K. Neutral Terminal: Solid and fully rated unless otherwise indicated.
- L. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater.
- M. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.
- N. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, by color-code or by numbered or lettered wire and cable with printed markers at terminations. Color-coding and wire and cable markers are specified in Section 260553 "Identification for Electrical Systems."
 - 1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
 - 2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
 - 3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
 - 4. Accessible via front access.
- O. Enclosures: General-purpose NEMA 250, Type 12, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.2 NONAUTOMATIC TRANSFER SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ASCO Power Technologies.
 - 2. Eaton.
 - 3. Approved Equal.

- B. Electrically Operated: Electrically actuated by push buttons designated "Normal Source" and "Alternative Source." Switch shall be capable of transferring load in either direction with either or both sources energized.
- C. Manual and Electrically Operated: Electrically actuated by push buttons designated "Normal Source" and "Alternative Source." Manual handle provides quick-make, quick-break manual-switching action. Switch shall be capable of electrically or manually transferring load in either direction with either or both sources energized. Control circuit disconnects from electrical operator during manual operation.
- D. Double-Throw Switching Arrangement: Incapable of pauses or intermediate position stops during switching sequence.
- E. Pilot Lights: Indicate source to which load is connected.
- F. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and alternative-source sensing circuits.
 - 1. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
 - 2. Emergency Power Supervision: Red light with nameplate engraved "Alternative Source Available."
- G. Unassigned Auxiliary Contacts: Switch shall have one set of normally closed contacts for each switch position, rated 10 A at 240-V ac.
- H. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
 - 1. Switch Action: Double throw; mechanically held in both directions.
 - 2. Contacts: Silver composition or silver alloy for load-current switching.
 - 3. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 4. Material: Tin-plated aluminum.
 - 5. Main and Neutral Lugs: Compression type.
 - 6. Ground Lugs and Bus-Configured Terminators: Compression type.
 - 7. Ground bar.
 - 8. Connectors shall be marked for conductor size and type according to UL 1008.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Identify components according to Section 260553 "Identification for Electrical Systems."
- B. Set field-adjustable intervals and delays, and relays.
- C. Comply with NECA 1.

3.2 CONNECTIONS

- A. Wiring to Remote Components: Match type and number of cables and conductors to control, and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.
- B. Wiring Method: Install cables in raceways and cable trays except within electrical enclosures. Conceal raceway and cables except in unfinished spaces.
 - 1. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
- D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- F. Connect twisted pair cable according to Section 260523 "Control-Voltage Electrical Power Cables."
- G. Route and brace conductors according to manufacturer's written instructions. and Section 260529 "Hangers and Supports for Electrical Systems." Do not obscure manufacturer's markings and labels.
- H. Final connections to equipment shall be made with liquid tight, flexible metallic conduit no more than 18 inches in length.

3.3 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. After installing equipment, test for compliance with requirements according to NETA ATS.
 - 2. Visual and Mechanical Inspection:
 - a. Compare equipment nameplate data with Drawings and Specifications.
 - b. Inspect physical and mechanical condition.
 - c. Inspect anchorage, alignment, grounding, and required clearances.
 - d. Verify that the unit is clean.
 - e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - f. Verify that manual transfer warnings are attached and visible.
 - g. Verify tightness of all control connections.
 - h. Inspect bolted electrical connections for high resistance using one of the following methods, or both:

- 1) Use of low-resistance ohmmeter.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.
- i. Perform manual transfer operation.
 - j. Verify positive mechanical interlocking between normal and alternate sources.
 - k. Perform visual and mechanical inspection of surge arresters.
 - l. Inspect control power transformers.
 - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
 - 2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
 - 3) Verify correct functioning of drawout disconnecting contacts, grounding contacts, and interlocks.
3. Electrical Tests:
- a. Perform insulation-resistance tests on all control wiring with respect to ground.
 - b. Perform a contact/pole-resistance test. Compare measured values with manufacturer's acceptable values.
 - c. Verify settings and operation of control devices.
 - d. Calibrate and set all relays and timers.
 - e. Verify phase rotation, phasing, and synchronized operation.
 - f. Perform automatic transfer tests.
 - g. Verify correct operation and timing of the following functions:
 - 1) Normal source voltage-sensing and frequency-sensing relays.
 - 2) Engine start sequence.
 - 3) Time delay on transfer.
 - 4) Alternative source voltage-sensing and frequency-sensing relays.
 - 5) Automatic transfer operation.
 - 6) Interlocks and limit switch function.
 - 7) Time delay and retransfer on normal power restoration.
 - 8) Engine cool-down and shutdown feature.
4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
- a. Check for electrical continuity of circuits and for short circuits.
 - b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
 - c. Verify that manual transfer warnings are properly placed.
 - d. Perform manual transfer operation.
5. After energizing circuits, perform each electrical test for transfer switches stated in NETA ATS and demonstrate interlocking sequence and operational function for each switch at least three times.

- a. Simulate power failures of normal source to automatic transfer switches and retransfer from emergency source with normal source available.
 - b. Simulate loss of phase-to-ground voltage for each phase of normal source.
 - c. Verify time-delay settings.
 - d. Verify pickup and dropout voltages by data readout or inspection of control settings.
 - e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
 - f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for one pole deviating by more than 50 percent from other poles.
 - g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.
6. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.
- a. Verify grounding connections and locations and ratings of sensors.

- B. Coordinate tests with tests of generator and run them concurrently.
- C. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- D. Transfer switches will be considered defective if they do not pass tests and inspections.
- E. Remove and replace malfunctioning units and retest as specified above.
- F. Prepare test and inspection reports.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.
- B. Training shall include testing ground-fault protective devices and instructions to determine when the ground-fault system shall be retested. Include instructions on where ground-fault sensors are located and how to avoid negating the ground-fault protection scheme during testing and circuit modifications.

END OF SECTION 263600

SECTION 264313 - SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Type 2 surge protective devices.
2. Enclosures.
3. Conductors and cables.

B. Related Requirements:

1. Section 262416 "Panelboards" for integral SPDs installed by panelboard manufacturer.
2. Section 262726 "Wiring Devices" for integral SPDs installed by receptacle manufacturer.

1.2 DEFINITIONS

A. Inominal: Nominal discharge current.

B. MCOV: Maximum continuous operating voltage.

C. Mode(s), also Modes of Protection: air of electrical connections where the VPR applies.

D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

E. NRTL: Nationally recognized testing laboratory.

F. OCPD: Overcurrent protective device.

G. SCCR: Short-circuit current rating.

H. SPD: Surge protective device.

I. Type 2 SPDs: Permanently connected SPDs intended for installation on the load side of the service disconnect overcurrent device, including SPDs located at the branch panel.

J. VPR: Voltage protection rating.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include electrical characteristics, specialties, and accessories for SPDs.
2. NRTL certification of compliance with UL 1449.

- a. Tested values for VPRs.
- b. Inominal ratings.
- c. MCOV, type designations.
- d. OCPD requirements.
- e. Manufacturer's model number.
- f. System voltage.
- g. Modes of protection.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For SPDs to include in maintenance manuals.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace SPDs that fail in materials or workmanship within five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TYPE 2 SURGE PROTECTIVE DEVICES (SPDs)

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. ABB, Electrification Products Division.
 - 2. Eaton.
 - 3. Schneider Electric USA, Inc.
 - 4. Siemens Industry, Inc., Energy Management Division.
 - 5. Approved Equal.
- B. Source Limitations: Obtain devices from single source from single manufacturer.
- C. Standards:
 - 1. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 2.
 - 2. Comply with UL 1283.
- D. Product Options:
 - 1. Include LED indicator lights for power and protection status.
 - 2. Include internal thermal protection that disconnects the SPD before damaging internal suppressor components.

3. Include NEMA ICS 5, dry Form C contacts rated at 2 A and 24 V ac for remote monitoring of protection status.
4. Include surge counter.

E. Performance Criteria:

1. MCOV: Not less than 125 percent of nominal system voltage for 208Y/120 V and 120/240 V power systems, and not less than 115 percent of nominal system voltage for 480Y/277 V power systems.
2. Peak Surge Current Rating: Minimum single-pulse surge current withstand rating per phase must not be less than 100 kA. Peak surge current rating must be arithmetic sum of the ratings of individual MOVs in a given mode.
3. The SPD surge current ratings shall be based on the electrical system ampacity listed in the table below:

Electrical System Ampacity @ SPD Install Point	Surge Protection (kA)	
	Per Mode	Per Phase
2500-6000A	300	600
1200-2000A	250	500
600-1000A	200	400
225-400A	150	300
125-225A	100	200

4. The SPD shall be rated for 240/120Vac 1 Phase, 3 Wire + Ground.
5. Modes of Protection: The SPD system shall provide surge protection in all possible modes (L-N, L-G, L-L, and N-G). Each replaceable module shall provide the uncompromising ability to deliver full surge current rating per mode.
6. SPD modules shall be configured to isolate individual suppression component failures without causing total loss of surge protection in that mode.
7. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits must not exceed the following:
 - a. Line to Neutral: 700 V.
 - b. Line to Ground: 700 V.
 - c. Neutral to Ground: 700 V.
 - d. Line to Line: 1200 V.
8. SCCR: Equal or exceed 100 kA.
9. Inominal Rating: 10 kA.

2.2 ENCLOSURES

- A. Indoor Enclosures: NEMA 250, Type 1.
- B. Outdoor Enclosures: NEMA 250, Type 4X.

2.3 CONDUCTORS AND CABLES

- A. Power Wiring: Same size as SPD leads, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Provide OCPD and disconnect for installation of SPD in accordance with UL 1449 and manufacturer's written instructions.
- C. Install leads between disconnects and SPDs short, straight, twisted, and in accordance with manufacturer's written instructions. Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
 - 1. Do not splice and extend SPD leads unless specifically permitted by manufacturer.
 - 2. Do not exceed manufacturer's recommended lead length.
 - 3. Do not bond neutral and ground.
- D. Use crimped connectors and splices only. Wire nuts are unacceptable.

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Compare equipment nameplate data for compliance with Drawings and the Specifications.
 - 2. Inspect anchorage, alignment, grounding, and clearances.
 - 3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.
- B. SPDs that do not pass tests and inspections will be considered defective. Replace and retest.
- C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

- A. Complete startup checks in accordance with manufacturer's written instructions.
- B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests; reconnect them immediately after the testing is over.
- C. Energize SPDs after power system has been energized, stabilized, and tested.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION 264313

CONTRACT ITEMS

**CONTRACT ITEM 1
MOBILIZATION AND DEMOBILIZATION**

Sect. 1.01 WORK INCLUDED AND PAYMENT

Mobilization and Demobilization shall consist of the cost of initiating the contract. Payment for Mobilization and Demobilization will be made at the lump sum price bid for this item in the proposal, which price shall include the cost of initiating the contract. The provisions for payment for the Item Mobilization and Demobilization supersede any provisions elsewhere in the specifications for including the cost of these initial services and facilities in the prices bid for the various items scheduled in the proposal. Fifty percent (50%) of the lump sum price bid for Mobilization and Demobilization shall be payable to the Contractor whenever he/she shall have completed 10 percent of the work of the contract. For the purposes of this Item, 10 percent of the work shall be considered complete when the total of payments earned, exclusive of the amount bid for this Item, shown on the monthly certificate of the approximate quantities of work done, shall exceed 10 percent of the total price bid for the contract and the required preconstruction investigation and verification of utilities is completed. The remaining 50% shall be payable upon substantial completion of the project.

The lump sum price bid for Mobilization and Demobilization should not exceed 3% of the total contract value.

CONTRACT ITEM 2 SAWCUT AND REMOVE EXISTING PAVEMENT

Sect. 2.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, materials and equipment necessary to sawcut and remove existing pavement in accordance with the plans and specifications.

Sect. 2.02 NOT USED

Sect. 2.03 METHOD OF MEASUREMENT

This work will be measured by the number of square yards of asphalt pavement removed within the approved pay limits as indicated on the Construction Drawings or in the Project Specifications. The asphalt pavement disturbance limits demonstrated on the contract documents are the maximum Limits indicated. It should be noted that the payment for asphalt pavement removal will be made based on the quantity measured in the Field. There will be no additional payment for asphalt pavement removal beyond the maximum Limit unless previous approval is granted by the engineer or the Brookfield WPCA representatives in writing prior to the work being performed.

Sect. 2.04 BASIS OF PAYMENT

The unit price bid for this item shall be full payment for furnishing all labor, equipment and materials, including preparation, removal, and all other necessary work to complete the asphalt pavement removal as shown on the drawings and specified herein.

**CONTRACT ITEM 3
SAWCUT AND REMOVE EXISTING CONCRETE**

Sect. 3.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, materials and equipment necessary to sawcut and remove existing concrete in accordance with the plans and specifications.

Sect. 3.02 NOT USED

Sect. 3.03 METHOD OF MEASUREMENT

This work will be measured by the number of square yards of concrete removed within the authorized pay limits indicated on the Construction Documents or specified in the Project Specifications. The asphalt pavement disturbance limits demonstrated on the contract documents are the maximum Limits indicated. It should be noted that the payment for asphalt pavement removal will be made based on the quantity measured in the Field. There will be no additional payment for concrete removal beyond the maximum Limit unless previous approval is granted by the engineer or the Brookfield WPCA representatives in writing prior to the work being performed.

Sect. 3.04 BASIS OF PAYMENT

The unit price bid for this item shall be full payment for furnishing all labor, equipment and materials, including preparation, removal, and all other necessary work to complete the asphalt pavement removal as shown on the drawings and specified herein.

CONTRACT ITEM 4 TEST PIT IN PAVEMENT

Sect. 4.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, materials and equipment necessary to complete two test pits, to determine elevations of utility crossings, as shown on the contract drawings. The test pits shall include pavement restoration. The contractor shall restore pavement with bituminous concrete hot mix asphalt superpave 0.5 a minimum of 9" in two lifts.

Sect. 4.02 GENERAL REQUIREMENTS

Work under this Item, shall conform to the following General Specifications:

- Sect. S-01 – Earthwork & Backfill
- Sect. S-08 – Restoration of Surfaces

Sect. 4.03 METHOD OF MEASUREMENT

The quantity to be measured for payment shall be the number of test pits excavated within the limits of the contract. The contractor shall notify the Engineer before starting any excavation, so that the quantity of test pits can be verified. When rock or large boulders are encountered, the contractor shall notify the Engineer for a determination. If the Contractor fails to give such notice or notices, or removes any material prior to speaking with the Engineer or WPCA, the Engineer or WPCA may presume that no additional cost may be claimed by the contractor for removal of such materials. The maximum plane dimensions for shall be 4 feet by 4 feet.

Sect. 4.04 BASIS OF PAYMENT

The unit price bid for this item shall be full payment for furnishing all labor, equipment and materials, including the preparation and removal of pavement, excavation, backfill, and all other necessary work to complete the asphalt pavement removal and restoration as shown on the drawings and specified herein.

CONTRACT ITEM 5 FORCEMAINS

Sect 5.01 WORK INCLUDED

Under this Item, the Contractor shall construct forcemains where shown on the plans. The work required under this Bid Item includes:

- 1) Removal and storage or disposal as directed of pavements, curbs, stored material, shrubs, etc.;
- 2) Survey and Stake-Out by a licensed Connecticut Land Surveyor;
- 3) Removal, storage, and replacement of topsoil on sites of trench work;
- 4) Excavation in open or sheeted trench as shown or required in accordance with the depths and grades shown, including temporary storage of excavated material, saw-cutting of bituminous pavement, and other work included **under Section S-1**; also, segregation and storage of topsoil and excavated material which is suitable for backfill.
- 5) Protection in place as required of all subsurface utilities and utility structures, which might be endangered or demolished during construction, in order that continuity of utility services will not be interrupted; this work includes the protection in place of building services or utility laterals, including their repair and replacement if damaged; also, safety procedures to protect workers, visitors, and general public.
- 6) Furnishing and placing pipe foundation material as shown or specified;
- 7) Furnishing and placing pipe encasement material as shown or specified;
- 8) Furnishing, placing, and compacting backfill as shown or specified.
- 9) Maintaining all existing drainage structures and crossings.
- 10) Furnishing and constructing pipe lines in and across Municipal roadways in compliance with all Municipal Agency requirements, including procurement of all necessary permits and payment of costs and fees in connection therewith; traffic control, sawcutting, and meeting all local and State Highway requirements.
- 11) Furnishing and constructing pipe lines in easements;
- 12) Safeguarding or removing and restoring, plantings, shrubs, trees, fences and other private property on or adjacent to the site of the work;
- 13) Furnishing, placing, and maintaining temporary pavement over backfilled trenches in or across paved shoulders, paved roads, streets, and driveways.
- 14) Repairs to existing structures if necessary including but not limited to infill and parging.
- 15) Cutting and capping existing sewer main as a result of proposed sewer main installation. Contractor shall note that existing pipes to be cut and capped shall proceed along with the construction sequence as required.
- 16) Disposal of all surplus material from the excavation and from other construction operations;
- 17) Cleaning up as the work progresses, including provision of dust control as required, specified and approved;
- 18) Cleaning, and testing the completed pipe line and repairing all leaks and imperfections disclosed thereby;
- 19) All other work required for a complete and satisfactorily operating pipe line system;
- 20) Conformance with State and Federal Safety Requirements;
- 21) Adhering to all regulations of CTDOT and WPCA (including obtaining all necessary permits);

- 22) All work specified or shown which is not included under any other item.
- 23) Locating underground utilities
- 24) Relocating interfering utilities where such DIRECT conflicts are shown on the Contract Drawings indicate that the utility shall be relocated;
- 25) Special construction requirements as required by all permits and approvals (identified on the drawings or in these specifications or contractor acquired permits and approvals).
- 26) Obtaining and paying for permit for dewatering discharges.
- 27) Testing of lines (physical and hydrostatic).

Sect 5.02 WORK NOT INCLUDED

The following work is not included under this Item.

- A. Furnishing and placing concrete, or concrete encasement for pipes, as ordered;
- B. Furnishing and placing additional foundation material for pipe, as ordered;
- C. Relocating interfering utilities, where direct conflict exists but is not shown on the Contract Drawings;
- D. Rock excavation; and,
- E. Furnishing and installing manholes, structures, and appurtenances.
- F. This Item does not include work described in, or payable under, other items in this contract.

Sect 5.03 GENERAL REQUIREMENTS

Work under this Bid Item shall conform to the following General Specifications:

- Sect. S-01 – Earthwork and Backfill
- Sect. S-04 – Pipes, Supports and Appurtenances

The attention of the Contractor is directed to the requirement that no portion of trench will be permitted to remain exposed overnight, unless otherwise approved.

Where pipes are to be laid across the roadway, trenches not completely backfilled by the end of the working day, shall be covered with steel plates sufficiently strong to carry roadway traffic.

Connections to existing manholes, pipe stubs, or sewers, shall be made as approved, using approved couplings or adapters so as to make a flexible, watertight joint, even with pipes of different materials.

Cuts for pavement removal shall be made with clean, straight, sharp edges, and parallel sides using saw cutters or other approved power tools. Pavement material shall be stored separate from other excavated material. The trench shall be backfilled to within the specified distance of the roadway level, shall be paved with temporary pavement, and shall be carefully maintained to insure a smooth roadway surface at all time. See Restoration of Surfaces specification section.

The Contractor will be required to obtain an excavation permit from the CTDOT. All requirements of the permit shall be included in the price of the work including provisions for the following: The

hours and days of work shall be approved by the DPW; Policemen shall be used for traffic control; the radio and newspaper shall be informed of construction activities; and, the Police Chief and Director of DPW shall be invited to the pre-construction Conference or a separate meeting held with them.

Sect. 5.04 METHOD OF MEASUREMENT

The quantity of force main pipe to be measured shall be the number of feet of pipe installed as indicated in the proposal as measured from outside wall to outside wall of force main structures and within the limits of the Contract. Measurement shall be through buried valves and fittings. For dual pipe force mains, only the footage of one pipe shall be measured. Prices shall include construction layout; pipe, fittings and appurtenances; flow diversion/by-pass pumping; excavation; protecting subsurface facilities; removing and disposing of all excess material including unsuitable excavation materials, pipe, manholes and structures within the same trench; bedding; backfilling; compaction as directed; sheeting; shoring and bracing; dewatering, including all pumps, filter bags, and spare materials as noted on the contract documents; initial/temporary pavement and surface restoration; installation of thrust blocking, testing and all other work and materials described hereinabove. Depth category shall be measured from finish grade to the invert of the pipe.

Sect. 5.05 BASIS OF PAYMENT

The prices bid shall cover all costs of furnishing and installing the forcemain pipes, including all materials, equipment, tools, and labor incidental thereto.

**CONTRACT ITEM 6
PVC SDR 35 SEWER PIPE**

Sect 6.01 WORK INCLUDED

Under this Item, the Contractor shall construct gravity sewer mains where shown on the plans. The work required under this Bid Item includes:

- 1) Removal and storage or disposal as directed of pavements, curbs, stored material, shrubs, etc.;
- 2) Survey and Stake-Out by a licensed Connecticut Land Surveyor;
- 3) Removal, storage, and replacement of topsoil on sites of trench work;
- 4) Excavation in open or sheeted trench as shown or required in accordance with the depths and grades shown, including temporary storage of excavated material, saw-cutting of bituminous pavement, and other work included **under Section S1**; also, segregation and storage of topsoil and excavated material which is suitable for backfill.
- 5) Protection in place as required of all subsurface utilities and utility structures, which might be endangered or demolished during construction, in order that continuity of utility services will not be interrupted; this work includes the protection in place of building services or utility laterals, including their repair and replacement if damaged; also, safety procedures to protect workers, visitors, and general public.
- 6) Furnishing and placing pipe foundation material as shown or specified;
- 7) Furnishing and placing pipe encasement material as shown or specified;
- 8) Furnishing, placing, and compacting backfill as shown or specified.
- 9) Maintaining all existing drainage structures and crossings.
- 10) Furnishing and constructing pipe lines in and across Municipal roadways in compliance with all Municipal Agency requirements, including procurement of all necessary permits and payment of costs and fees in connection therewith; traffic control, sawcutting, and meeting all local and State Highway requirements.
- 11) Furnishing and constructing pipe lines in easements;
- 12) Safeguarding or removing and restoring, plantings, shrubs, trees, fences and other private property on or adjacent to the site of the work;
- 13) Furnishing, placing, and maintaining temporary pavement over backfilled trenches in or across paved shoulders, paved roads, streets, and driveways.
- 14) Repairs to existing structures if necessary including but not limited to infill and parging.
- 15) Cutting and capping existing sewer main as a result of proposed sewer main installation. Contractor shall note that existing pipes to be cut and capped shall proceed along with the construction sequence as required.
- 16) Disposal of all surplus material from the excavation and from other construction operations;
- 17) Cleaning up as the work progresses, including provision of dust control as required, specified and approved;
- 18) Cleaning, and testing the completed pipe line and repairing all leaks and imperfections disclosed thereby;
- 19) All other work required for a complete and satisfactorily operating pipe line system;
- 20) Conformance with State and Federal Safety Requirements;
- 21) Adhering to all regulations of CTDOT and WPCA (including obtaining all necessary permits);

- 22) All work specified or shown which is not included under any other item.
- 23) Locating underground utilities
- 24) Relocating interfering utilities where such DIRECT conflicts are shown on the Contract Drawings indicate that the utility shall be relocated;
- 25) Special construction requirements as required by all permits and approvals (identified on the drawings or in these specifications or contractor acquired permits and approvals).
- 26) Obtaining and paying for permit for dewatering discharges.
- 27) Testing of lines (physical and hydrostatic).

Sect 6.02 WORK NOT INCLUDED

The following work is not included under this Item.

- A. Furnishing and placing concrete, or concrete encasement for pipes, as ordered;
- B. Furnishing and placing additional foundation material for pipe, as ordered;
- C. Relocating interfering utilities, where direct conflict exists but is not shown on the Contract Drawings;
- D. Rock excavation; and,
- E. Furnishing and installing manholes, structures, and appurtenances.
- F. This Item does not include work described in, or payable under, other items in this contract.

Sect 6.03 GENERAL REQUIREMENTS

Work under this Bid Item shall conform to the following General Specifications:

- Section S-01 – Earthwork and Backfill
- Section S-04 – Pipes, Supports and Appurtenances

The attention of the Contractor is directed to the requirement that no portion of trench will be permitted to remain exposed overnight, unless otherwise approved.

Where pipes are to be laid across the roadway, trenches not completely backfilled by the end of the working day, shall be covered with steel plates sufficiently strong to carry roadway traffic.

Connections to existing manholes, pipe stubs, or sewers, shall be made as approved, using approved couplings or adapters so as to make a flexible, watertight joint, even with pipes of different materials.

Cuts for pavement removal shall be made with clean, straight, sharp edges, and parallel sides using saw cutters or other approved power tools. Pavement material shall be stored separate from other excavated material. The trench shall be backfilled to within the specified distance of the roadway level, shall be paved with temporary pavement, and shall be carefully maintained to insure a smooth roadway surface at all time. See Restoration of Surfaces specification section.

The Contractor will be required to obtain an excavation permit from the CTDOT. All requirements of the permit shall be included in the price of the work including provisions for the following: The

hours and days of work shall be approved by the DPW; Policemen shall be used for traffic control; the radio and newspaper shall be informed of construction activities; and, the Police Chief and Director of DPW shall be invited to the pre-construction Conference or a separate meeting held with them.

Sect. 6.04 METHOD OF MEASUREMENT

The quantity of gravity sewer pipe to be measured shall be the number of linear feet of pipe installed of the various diameters and materials and at the depth categories indicated in the proposal as measured from center to center of manholes minus one-half the inside diameter for each manhole and within the limits of the Contract. It should be noted that the contract documents represent the linear feet of pipe from the center of manhole to center of manhole. The contractor shall be aware that the quantity of pipe noted in the proposal pages will be larger than what may be measured in the field. Prices shall include construction layout; pipe, fittings and appurtenances; flow diversion/by-pass pumping; excavation; protecting subsurface facilities; removing and disposing of all excess material including unsuitable excavation materials; pipe; bedding; backfilling; compaction; dewatering; initial/temporary pavement and lawn restoration; testing and all other work and materials described hereinabove. Depth category shall be measured from finish grade to the top of the pipe.

Sect. 6.05 BASIS OF PAYMENT

The prices bid shall cover all costs of furnishing and installing the gravity pipe, including all materials, equipment, tools, and labor incidental thereto.

**CONTRACT ITEM 7
CONNECT TO EXISTING MANHOLE**

Sect. 7.01 WORK INCLUDED

Under this Item, the Contractor shall core drill through an existing manhole, reconstruct invert to accommodate the forcemain connection, parge the inside of the manhole and parge the pipe connection.

Sect. 7.02 WORK NOT INCLUDED

This Item does not include work described in, or payable under, other items in this contract.

Sect. 7.03 GENERAL REQUIREMENTS

Work under this Item, shall conform to the following General Specifications:

- Sect. S-01 – Earthwork and Backfill
- Sect. S-04 – Pipes, Supports and Appurtenances

Sect. 7.04 METHOD OF MEASUREMENT

The quantity to be measured for payment under this Item shall be the number of connections to be made to existing manhole.

Sect. 7.05 BASIS OF PAYMENT

The price bid shall cover all cost of connecting into the existing manhole with all appurtenances including all materials, equipment, tools and labor incidental thereto. Price shall also include but not be limited to excavation; flow diversion/bypass pumping; removing and disposing of all excess material including excavation materials; backfilling; compaction; sheeting; shoring and bracing; dewatering; concrete and all other work and materials described hereinabove.

**CONTRACT ITEM 8
CONNECT TO EXISTING SEWER SERVICES FROM BUILDINGS**

Sect. 8.01 WORK INCLUDED

Under this Item, the Contractor shall connect the existing sanitary sewer services leaving the buildings to the proposed service lines including the fittings required to make these connections.

Sect. 8.02 WORK NOT INCLUDED

This Item does not include work described in, or payable under, other items in this contract.

Sect. 7.03 GENERAL REQUIREMENTS

Work under this Item, shall conform to the following General Specifications:

- Sect. S-01 – Earthwork and Backfill
- Sect. S-04 – Pipes, Supports and Appurtenances

Sect. 8.04 METHOD OF MEASUREMENT

The quantity to be measured for payment under this Item shall be the number of connections to be made.

Sect. 8.05 BASIS OF PAYMENT

The price bid shall cover all cost of connecting the existing service lines with all appurtenances including all materials, equipment, tools and labor incidental thereto. Price shall also include but not be limited to excavation; flow diversion/bypass pumping; removing and disposing of all excess material including excavation materials; backfilling; compaction; sheeting; shoring and bracing; dewatering; concrete and all other work and materials described hereinabove. The price bid shall not include the commissioning of septic tanks, which will be covered under a separate Contract Item.

CONTRACT ITEM 9 SEWER MANHOLE

Sect 9.01 WORK INCLUDED

Under this Item, the Contractor shall furnish and install precast concrete watertight manhole, complete with appurtenances of the types and sizes, and depth range shown and as specified. This Item includes but is not limited to standard manholes on gravity sanitary sewers all in conformity with the lines, grades, dimensions and details shown on the plans, or as ordered, and in accordance with the provisions of the specifications for the various materials and work which constitute the completed structure. Other work under this Bid Item includes:

- 1) Survey and Stake-Out by a licensed Connecticut Land Surveyor;
- 2) Conformance with State and Federal Safety Requirements;
- 3) Adhering to all regulations of CTDOT and WPCA (including obtaining all necessary permits);
- 4) Testing of manhole.

Sect. 9.02 WORK NOT INCLUDED

This Item does not include work described in, or payable under, other items in this contract.

Sect. 9.03 GENERAL REQUIREMENTS

Work under this Item, shall conform to the following General Specifications:

- Sect. S-01 – Earthwork and Backfill
- Sect. S-02 – Concrete
- Sect. S-04 – Pipes, Supports and Appurtenances
- Sect. S-06 – Manholes and Chambers

Sect. 9.04 METHOD OF MEASUREMENT

The quantity to be measured for payment under this Item shall be the number of standard sewer manholes with a depth of 6'-6" or less and a depth of greater than 6'-6".

Sect. 9.05 BASIS OF PAYMENT

The price bid shall cover all cost of furnishing and installing the manhole with all appurtenances including all materials, equipment, tools and labor incidental thereto. Price shall also include but not be limited to frames and covers, excavation; removing and disposing of all excess material including excavation materials and manholes; castings; bedding; backfilling; compaction; sheeting; shoring and bracing; dewatering; concrete and all other work and materials described hereinabove.

**CONTRACT ITEM 10
MISCELLANEOUS CONCRETE**

Sect. 10.01 WORK INCLUDED

Under this Item, the Contractor shall furnish and place 3500 psi concrete for miscellaneous purposes (e.g. encasements, cradles, thrust blocks) in and around the work as required and ordered and not shown on the drawings or described in the specifications as included.

Sect 10.02 WORK NOT INCLUDED

This Item includes all work described in Section 10.01 but does not include work described in, or payable under other items in this contract.

Sect. 10.03 METHOD OF MEASUREMENT

The quantity to be measured for payment under this Item shall be the number of cubic yards of concrete placed as ordered.

Concrete which is included for payment under other Items, such as thrust blocks, concrete within chambers, manholes, encasements shown on the drawings will not be included for payment under this Item.

Sect. 10.04 BASIS OF PAYMENT

The price per cubic yard bid under this Item shall cover all costs of furnishing and placing concrete, including form work, as required and ordered.

**CONTRACT ITEM 11
ABANDON EXISTING TANKS AND CHAMBERS**

Sect. 11.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, materials and equipment necessary to abandon existing septic tanks in accordance with the CT public health code and all state and local regulations.

Sect. 11.02 GENERAL REQUIREMENTS

Work under this Item, shall conform to the following General Specifications:

Sect. S-08 - Restoration of Surfaces

Section 11.03 METHOD OF MEASUREMENT

Item 11: Abandon Existing Tanks and Chambers. This work will be measured by the cubic yards of sand required to backfill each septic tank.

Section 11.04 BASIS OF PAYMENT

The price per cubic yard bid under this Item shall cover all costs of exposing and abandoning existing septic tanks including collapsing the concrete top, backfilling with sand and restoring the disturbed area. The price per cubic yard bid under this tem shall also include the cost associated with having the septic tanks pumped out prior to abandoning.

CONTRACT ITEM 12 INLET PROTECTION

Sect 12.01 WORK INCLUDED

Under this Item, the Contractor shall furnish and install inlet protection as specified on the contract drawings. The Engineer may order additional control measures if the measures installed per the contract documents prove insufficient.

Sect. 12.02 WORK NOT INCLUDED

This Item does not include work described in, or payable under, other items in this contract.

Sect. 12.03 GENERAL REQUIREMENTS

Work under this Item, shall conform to the following General Specifications:

Sect. S-05 – Erosion and Sediment Control

Sect. 12.04 METHOD OF MEASUREMENT

This work will be measured by each inlet protection installed as shown on the plans or as ordered by the Engineer, CTDOT, or WPCA. No measurement will be made for maintenance, repairs, or replacement of defective material, or removal. Refer to inlet protection detail within contact documents for additional information.

Sect. 12.05 BASIS OF PAYMENT

The unit price bids for each item shall cover all costs of furnishing and installing inlet protection devices noted in the contract documents including all materials, equipment, tools and labor incidental thereto. The unit bid price shall include the maintenance, repair and replacement if necessary of this time for the duration of the project.

CONTRACT ITEM 13 LAWN RESTORATION

Sect. 13.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, materials, and equipment necessary to restore grassed areas in accordance with the plans and specifications.

Sect. 13.02 GENERAL REQUIREMENTS

This Item does not include work described in, or payable under, other items in this contract.

Section 13.03 METHOD OF MEASUREMENT

This work will be measured by the number of square feet of grass area restoration. It should be noted that the payment for lawn restoration will be made based on the quantity measured in the Field. There will be no additional payment for lawn disturbance beyond the necessary limit.

Section 13.04 BASIS OF PAYMENT

The square foot bid price for this item shall be full payment for furnishing all labor, equipment and materials, necessary to complete the lawn restoration as shown on the drawings and specified herein.

**CONTRACT ITEM 14
REPAIR DRIVEWAY**

Sect. 14.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, materials, and equipment necessary to place Item 4 in accordance with the plans and specifications. This driveway is to be maintained throughout construction. The driveway shall be ready to be placed asphalt at the end of construction.

Sect. 14.02 GENERAL REQUIREMENTS

This Item does not include work described in, or payable under, other items in this contract.

Section 14.03 METHOD OF MEASUREMENT

This work to repair the item 4 driveway shall be measured by the lump sum to restore the driveway to existing conditions.

Section 14.04 BASIS OF PAYMENT

The lump sum bid price for this item shall be full payment for furnishing all labor, equipment and materials, including the preparation, placing of item 4, and rolling necessary to complete the driveway repair as shown on the drawings and specified herein.

CONTRACT ITEM 15 SILT FENCE

Sect 15.01 WORK INCLUDED

Under this Item, the Contractor shall furnish and install silt fence as specified on the contract drawings. The Engineer may order additional control measures if the measures installed per the contract documents prove insufficient.

Sect. 15.02 WORK NOT INCLUDED

This Item does not include work described in, or payable under, other items in this contract.

Sect. 15.03 GENERAL REQUIREMENTS

Work under this Item, shall conform to the following General Specifications:

Sect. S-05 – Erosion and Sediment Control

Sect. 15.04 METHOD OF MEASUREMENT

This work will be measured by the number of linear feet (measured horizontally between the extreme outer limits of the silt fence) installed as shown on the plans or as ordered by the Engineer. No measurement will be made for maintenance, repairs, or replacement of defective material, seams, overlaps, or removal of fencing after the project area has been deemed stabilized by the WPCA. Refer to silt fence detail within contract documents for additional information.

Sect. 15.05 BASIS OF PAYMENT

The unit price bids for silt fence shall cover all costs of furnishing and installing silt fence noted in the contract documents including all materials, equipment, tools and labor incidental thereto. The unit bid price shall also include the maintenance

**CONTRACT ITEM 16
STABILIZED CONSTRUCTION ENTRANCE**

Sect 16.01 WORK INCLUDED

Under this Item, the Contractor shall furnish and install the stabilized construction entrance as specified on the contract drawings. The Engineer or Brookfield Water Pollution Control Authority may order additional material to be placed if the measures installed per the contract documents prove insufficient.

Sect. 16.02 WORK NOT INCLUDED

This Item does not include work described in, or payable under, other items in this contract.

Sect. 16.03 GENERAL REQUIREMENTS

Work under this Item, shall conform to the following General Specifications:

Sect. S-05 – Erosion and Sediment Control

Sect. 16.04 METHOD OF MEASUREMENT

This work will be measured by the number of each stabilized construction entrance installed as shown on the plans or as ordered by the Engineer. No payment will be made for maintenance, repairs, or replacement of material, or removal of stabilized construction entrance after the project area has been deemed stabilized by the WPCA. Refer to stabilized construction entrance detail within contract documents for additional information.

Sect. 16.05 BASIS OF PAYMENT

The unit price bids for the stabilized construction entrance shall cover all costs of furnishing and installing the stabilized construction entrance noted in the contract documents including all materials, equipment, tools and labor incidental thereto.

CONTRACT ITEM 17 ELECTRICAL CONNECTION

Sect. 17.01 WORK INCLUDED AND PAYMENT

Under this Item, the Contractor shall furnish, deliver, install, test, place in satisfactory operation and guarantee all work and equipment for a complete electrical and instrumentation system for the generator as described in the supplementary specifications attached to these specifications and the contract drawings.

Sect. 17.02 WORK NOT INCLUDED

This Item does not include work described in or payable under other items of this contract.

All work shall conform to the requirements of the Specifications and all other Contract Documents.

Sect. 17.03 GENERAL REQUIREMENTS

Work under this item shall conform to the following General Specifications:

- Section 260001 – Basic Electrical Materials and Methods
- Section 260519 – Low-Voltage Electrical Power Conductors and Cables
- Section 260523 – Control-Voltage Electrical Power Cables
- Section 260526 – Grounding and Bonding
- Section 260529 – Hangers and Supports
- Section 260553 – Electrical Identification
- Section 260800 – Heat Tracing and Insulation
- Section 262416 – Panelboards
- Section 262726 – Wiring Devices
- Section 262816 – Enclosed Switches and Circuit Breakers
- Section 263600 – Transfer Switches
- Section 264313 – Surge Protection for Low-Voltage Electrical Power Circuits

Sect. 17.04 METHOD OF MEASUREMENT

Electrical work for the generator shall be measured by the lump sum.

Sect. 17.05 BASIS OF PAYMENT

The lump sum price bid under this Item shall cover all costs of electrical and instrumentation work specified and required, including all work specified in the Supplementary Specifications. Payment shall be made based upon the schedule of values to be agreed upon by the contractor and engineer.

CONTRACT ITEM 18 PAVEMENT RESTORATION

Sect. 18.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, materials, and equipment necessary to place asphaltic concrete courses in accordance with the plans and specifications. The thickness shall be as indicated on the construction documents.

Sect. 12.02 GENERAL REQUIREMENTS

Work under this Item, shall conform to the following General Specifications:

- Sect. CI-05 - Forcemains
- Sect. CI-06 – Sewer Pipe
- Sect. CI-09 – Sewer Manholes

Section 18.03 METHOD OF MEASUREMENT

This work will be measured by the number of square yards of asphalt concrete limits in place. No measurement will be made for maintenance, repairs, or replacement of defective material. The permanent pavement disturbance limits demonstrated on the contract documents are the maximum Limits indicated. It should be noted that the payment for permanent pavement will be made based on the quantity measured in the Field. There will be no additional payment for pavement disturbance beyond the maximum Limit unless previous approval is granted by the engineer or the Brookfield WPCA representatives in writing.

Where the sawcut line is less than 24" from the edge of existing pavement the contractor shall mill and overlay the area up to the edge of existing pavement. The additional area shall be included in the unit price bid for the pavement restoration. Refer to contract documents for additional milling and paving limits.

Section 18.04 BASIS OF PAYMENT

The unit price bid for this item shall be full payment for furnishing all labor, equipment and materials, including the preparation, placing of tack coat, mixing, transportation, placing, and rolling necessary to complete the permanent pavement restoration as shown on the drawings and specified herein.

CONTRACT ITEM 19 CLEANOUTS

Sect. 19.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, materials and equipment necessary to install a cleanout in accordance with the plans and specifications. This shall include all excavation, structural backfill, pipe materials, casting, and concrete pad.

Sect. 19.02 GENERAL REQUIREMENTS

This Item does not include work described in, or payable under, other items in this contract.

Sect. 19.03 METHOD OF MEASUREMENT

This work will be measured by each number of cleanout installed.

Sect. 19.04 BASIS OF PAYMENT

The prices bid shall cover all costs of furnishing and installing the cleanout in accordance with the project details and/or specifications.

**CONTRACT ITEM 20
WET WELL AND SEWER LINE SHEETING AND SHORING**

Sect. 20.01 WORK INCLUDED AND PAYMENT

Note: All design and investigation is the responsibility of the contractor.

Work required under this item includes:

- 1) Temporary sheeting and bracing, soil consolidation, or any other approved construction methods required to safeguard working conditions, public or private property and traffic;
- 2) Permanent sheeting and bracing for trenches where called for by the drawings and specifications, including submission of design of same for approval if ordered;

Payment for Sewer Sheeting & Shoring will be made at the lump sum price bid for this item in the proposal. Payment shall be payable upon completion of the project. The lump sum price bid for this item shall include all labor, material, submittals, equipment, and all work necessary to satisfactorily complete the work as specified.

**CONTRACT ITEM 21
AS-BUILT**

Sect 21.01 WORK INCLUDED

Under this Item, the Contractor shall furnish all labor, materials, and equipment necessary to complete an As-Built in accordance with the WPCA regulations.

Sect. 21.02 WORK NOT INCLUDED

This Item does not include work described in, or payable under, other items in this contract.

Sect. 21.03 METHOD OF MEASUREMENT

All work performed under this item shall be a lump sum. It shall include employment of a CT licensed professional land surveyor and personnel with electronic total station equipment to perform all work and provide all materials necessary for the proper as-built of the final grade, the location of all above and below grade structures, pavement, sewer, pipe inverts, and any other item shown on the plans. It shall also include submission of all certified drawings and electronic files and all other work and materials described hereinabove and as required to as-built the final project.

**CONTRACT ITEM 22
ALLOWANCE FOR DEWATERING**

Sect. 22.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, material, and equipment required to accomplish dewatering work, necessitated by having encountered, during the course of the work, field conditions of a nature not determinable during design, or for which no unit prices are applicable.

Section 22.02 METHOD OF MEASUREMENT

Only that dewatering work shall be performed by the Contractor and will be paid for by the WPCA as has been authorized by the Engineer in writing, prior to this commencement.

Section 22.03 BASIS OF PAYMENT

The total amount paid to the Contractor will be determined in accordance with the signed contract defining dewatering work, and such payment will include only that overhead and profit that is applicable to the work performed under this item.

The Contractor shall include in his total bid the fixed lump sum value printed in the proposal opposite this item. It should be noted that the Contractor is only entitled to payment against this item for work performed by the Contractor and authorized by the Engineer in writing. The total fixed lump sum value is not owed to the contractor.

**CONTRACT ITEM 23
MISCELLANEOUS ADDITIONAL WORK**

Sect. 23.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, material, and equipment required to accomplish miscellaneous additional work, necessitated by having encountered, during the course of the work, field conditions of a nature not determinable during design, or for which no unit prices are applicable.

Section 23.02 METHOD OF MEASUREMENT

Only that miscellaneous additional work shall be performed by the Contractor and will be paid for by the WPCA as has been authorized by the Engineer in writing, prior to this commencement.

Special Conditions, entitled "Deletion of Work" will still apply regarding that the work under the contract may be increased or decreased.

Section 23.03 BASIS OF PAYMENT

The total amount paid to the Contractor will be determined in accordance with the signed contract defining additional work, and such payment will include only that overhead and profit that is applicable to the work performed under this item.

The Contractor shall include in his total bid the fixed lump sum value printed in the proposal opposite this item. It should be noted that the Contractor is only entitled to payment against this item for work beyond the contract scope that has a written extra work order approval by the WPCA or authorized representative. The total fixed lump sum value is not owed to the contractor. This amount is given for the purpose of canvas, and any bid other than the specified amount will be considered informal.

CONTRACT ITEM 24 ALLOWANCE FOR ROCK

Sect. 24.01 DESCRIPTION

Under this Item, the Contractor shall excavate rock and remove boulders in pipe trenches and excavations, including disposing of surplus excavated rock, backfilling of trenches with acceptable material to the original level of rock, dewatering the trench, and protecting existing structures, as shown, specified, or ordered.

Sect. 24.02 GENERAL REQUIREMENTS

This Item does not include work described in, or payable under, other items in this contract.

Sect. 24.03 METHOD OF MEASUREMENT

The quantity to be measured for payment under this Item shall be the number of cubic yards of rock contained within the planes defined by the existing rock surface and the payment lines shown or ordered; and boulders, or masonry in excess of 1 cubic yard. Removal of concrete paving after sawcutting shall not be measured under this Item, but shall be considered included in the Contractor's unit bid price for other appropriate items.

Sect. 24.04 BASIS OF PAYMENT

The price per cubic yard bid under this Item shall cover all costs of excavating rock and removing boulders, suitable backfill material, disposal of rock and all related labor and materials.

**CONTRACT ITEM 25
TREE REMOVAL**

Sect 25.01 WORK INCLUDED

Under this Item, the Contractor shall existing trees as indicated by the Engineer or as shown on the contract documents

Sect. 25.02 MATERIALS

Not Used

Sect. 25.03 MEASUREMENT AND PAYMENT

The quantity to be measured for payment shall be the number of trees removed within the limits of the contract. The contractor shall notify the Engineer before removing any trees. All trees to be removed shall be mark and approved prior to removal. Removal of tree shall include the removal of the tree stump.

CONTRACT ITEM 26 MODULAR WALL

Sect. 26.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, materials and equipment necessary to construct the modular wall in accordance with the plans and specifications and manufacturers requirements.

Sect. 26.02 GENERAL REQUIREMENTS

Work under this Item, shall conform to the following General Specifications:

Sect. S-08 - Restoration of Surfaces

Sect. 26.03 METHOD OF MEASUREMENT

This work will be measured by the number of square feet of exposed wall. No measurement will be made for the buried portions of the wall or the required backfill, reinforcing grid or other related wall components. There will be no additional payment for excavation, structural backfill or the wall cap.

Sect. 26.04 BASIS OF PAYMENT

The prices bid shall cover all costs of furnishing and installing the modular wall, including all materials, equipment, tools and labor incidental thereto.

**CONTRACT ITEM 27
GENERAL CONSTRUCTION OF PUMP STATION**

Sect 27.01 WORK INCLUDED

The following principal items of work are included in this item(s):

- 1) Clearing and grubbing of the site, stockpiling of topsoil.
- 2) Installation of soil erosion controls.
- 3) Protection of public and private property.
- 4) Grading of the site.
- 5) Furnishing and installation of the wet well, pumps, valves and associated piping.
- 6) Furnishing and installation of concrete pads for various equipment.
- 7) Installation of service line, yard hydrant and backflow prevention device including but not limited to coordination with Water purveyor.
- 8) Furnishing and installation of gravity sewer pipe and manholes within the limits shown on the drawings.
- 9) Extensions to and connection to existing off-site electric and telephone utility.
- 10) All interconnecting piping, valves and fittings.
- 11) Fencing, pavement, ground cover, plantings and other site amenities indicated.
- 12) Force main piping to the limits indicated.
- 13) Restoration of all disturbed surfaces.
- 14) Test all installations and obtain approval of the Engineer.
- 15) Excavation, excavation support system and dewatering system and design of such systems by a licensed professional engineer.

Sect 27.02 WORK NOT INCLUDED

This Item includes all work described in or payable under other items of this contract. See Electrical and Instrumentation Construction item for remaining work included with the pump stations.

Sect 27.03 GENERAL REQUIREMENTS

Work under this item shall conform to the following General Specifications:

- Section S-01 – Earthwork and Backfill
- Section S-07 – Valves
- Section S-16 – Hot Mix Asphalt Paving
- Section S-17 – Cast-in-Place Concrete
- Section S-18 – Precast Concrete
- Section S-19 – Grout
- Section S-20 – Access Doors

Section S-21 – Shop Painting
Section S-22 – Field Painting
Section S-23 – Pumps and Appurtenances

NOTE: All work in underground chambers to be performed using appropriate confined space requirements. As a minimum, the Contractor shall use approved gas meters, harnesses, radios (above and below grade) trained surface emergency personnel, A-frame hoists, etc. Procedures must meet requirements of the Authority's Regulations, State regulations, OSHA, or the Engineer's requirements. All costs of confined space entry shall be included in the prices bid.

Sect. 27.04 METHOD OF MEASUREMENT

The pump station construction shall be measured by the lump sum. Items of work covered by this bid item are as indicated on the drawing as limit of work or as described in the specifications.

Sect. 27.05 BASIS OF PAYMENT

Payment for the lump sums shall be based upon the completion of work identified in a schedule of values to be agreed upon between the engineer and contractor.

**CONTRACT ITEM 28
MAINTENANCE AND PROTECTION OF TRAFFIC**

Sect. 28.01 WORK INCLUDED AND PAYMENT

Maintenance and Protection of Traffic (MPT) shall consist of the cost of furnishing, installing, and maintaining MPT, as specified on the contract documents, throughout the duration of the project. The MPT shall comply with rules and regulation of the CTDOT. Payment for Maintenance and Protection of Traffic will be made at the lump sum price bid for this item in the proposal. Payment shall be payable upon completion of the project. The lump sum price bid for this item shall include all labor, material, submittals, equipment, traffic control devices, signs, retaining of police oversight and all work necessary to satisfactorily complete the work as specified

CONTRACT ITEM 29 FORCEMAIN CLEANOUT MANHOLE

Sect. 29.01 WORK INCLUDED

Under this Item, the Contractor shall furnish and install precast concrete watertight manhole, complete with appurtenances of the types and sizes, and depth range shown on the contract drawings and as specified. This Item includes but is not limited to standard precast manhole and casting all in conformity with the lines, grades, dimensions and details shown on the plans, or as ordered, and in accordance with the provisions of the specifications for the various materials and work which constitute the completed structure. This item shall also include all of the required piping, valves and supports shown of the contract drawings and/or specified. Other work under this Bid Item includes:

- 1) Survey and Stake-Out by a licensed Connecticut Land Surveyor;
- 2) Conformance with State and Federal Safety Requirements;
- 3) Adhering to all regulations of CTDOT and WPCA (including obtaining all necessary permits);
- 4) Testing of manhole.

Sect. 29.02 WORK NOT INCLUDED

This Item does not include work described in, or payable under, other items in this contract.

Sect. 29.03 GENERAL REQUIREMENTS

Work under this Item, shall conform to the following General Specifications:

- Sect. S-01 – Earthwork and Backfill
- Sect. S-02 – Concrete
- Sect. S-04 – Pipes, Supports and Appurtenances
- Sect. S-06 – Manholes and Chambers

Sect. 29.04 METHOD OF MEASUREMENT

The quantity to be measured for payment under this Item shall be the number of standard forcemain manhole.

Sect. 29.05 BASIS OF PAYMENT

The price bid shall cover all cost of furnishing and installing the manhole with all appurtenances including all materials, equipment, tools and labor incidental thereto. Price shall also include but not be limited to frames and covers, excavation; removing and disposing of all excess material including excavation materials and manholes; castings; bedding; backfilling; compaction; sheeting; shoring and bracing; dewatering; concrete and all other work and materials described hereinabove.

**CONTRACT ITEM 30
DUAL FORCEMAIN CLEANOUT MANHOLE**

Sect 30.01 WORK INCLUDED

Under this Item, the Contractor shall furnish and install precast concrete watertight manhole, complete with appurtenances of the types and sizes, and depth range shown on the contract drawings and as specified. This Item includes but is not limited to standard precast manhole and casting all in conformity with the lines, grades, dimensions and details shown on the plans, or as ordered, and in accordance with the provisions of the specifications for the various materials and work which constitute the completed structure. This item shall also include all of the required piping, valves and supports shown of the contract drawings and/or specified. Other work under this Bid Item includes:

- 1) Survey and Stake-Out by a licensed Connecticut Land Surveyor;
- 2) Conformance with State and Federal Safety Requirements;
- 3) Adhering to all regulations of CTDOT and WPCA (including obtaining all necessary permits);
- 4) Testing of manhole.

Sect. 30.02 WORK NOT INCLUDED

This Item does not include work described in, or payable under, other items in this contract.

Sect. 30.03 GENERAL REQUIREMENTS

Work under this Item, shall conform to the following General Specifications:

- Sect. S-01 – Earthwork and Backfill
- Sect. S-02 – Concrete
- Sect. S-03 – Pipes, Supports and Appurtenances
- Sect. S-04 – Manholes and Chambers

Sect. 30.04 METHOD OF MEASUREMENT

The quantity to be measured for payment under this Item shall be the number of standard forcemain manhole.

Sect. 30.05 BASIS OF PAYMENT

The price bid shall cover all cost of furnishing and installing the manhole with all appurtenances including all materials, equipment, tools and labor incidental thereto. Price shall also include but not be limited to frames and covers, excavation; removing and disposing of all excess material including excavation materials and manholes; castings; bedding; backfilling; compaction; sheeting; shoring and bracing; dewatering; concrete and all other work and materials described hereinabove. Price shall also include all pipe, fittings, valves, and supports as shown on the details or specified.

**CONTRACT ITEM 31
CURB VALVE AND BOX**

Sect. 31.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, materials and equipment necessary to install a curb valve and Box in accordance with the plans and specifications. This shall include all excavation, structural backfill, pipe materials, valve, valve box, and concrete pad.

Sect. 31.02 GENERAL REQUIREMENTS

This Item does not include work described in, or payable under, other items in this contract.

Sect. 31.03 METHOD OF MEASUREMENT

This work will be measured by each number of curb valves and boxes installed.

Sect. 31.04 BASIS OF PAYMENT

The prices bid shall cover all costs of furnishing and installing the curb valve and box in accordance with the project details and/or specifications.

**CONTRACT ITEM 32
RECONSTRUCT EXISTING CURB**

Sect. 32.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, materials and equipment necessary to remove and reconstruct curb in accordance with the plans and specifications.

Sect. 32.02 GENERAL REQUIREMENTS

Work under this Item, shall conform to the following General Specifications:

Sect. S-08 – Restoration of Surfaces

Sect 32.03 METHOD OF MEASUREMENT

This work will be measured by the number of linear feet of curb limits in place. No measurement will be made for maintenance, repairs, or replacement of defective material. The curb disturbance limits demonstrated on the contract documents are the maximum Limits indicated. It should be noted that the payment for curb will be made based on the quantity measured in the Field. There will be no additional payment for curb disturbance beyond the maximum Limit unless previous approval is granted by the engineer or the Brookfield WPCA representatives in writing.

Sect. 32.04 BASIS OF PAYMENT

The unit price bid for this item shall be full payment for furnishing all labor, equipment and materials, including the preparation, removal, cutting of keys, placing of tack coat, mixing, transportation, and placing necessary to complete the curb reconstruction as shown on the drawings and specified herein.

CONTRACT ITEM 33 CONCRETE SIDEWALK AND DRIVEWAY RESTORATION

Sect. 33.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, materials, and equipment necessary to place concrete sidewalk and driveway aprons in accordance with the plans and specifications. The thickness shall be as indicated on the construction documents and all work shall be performed in accordance with CTDOT specifications

Sect. 33.02 GENERAL REQUIREMENTS

Work under this Item, shall conform to the following General Specifications:

- Sect. S-04 – Pipes, Supports and Appurtenances
- Sect. S-06 - Manholes and Chambers
- Sect. S-08 - Restoration of Surfaces

Section 33.03 METHOD OF MEASUREMENT

This work will be measured by the number of square yard of concrete limits in place. No measurement will be made for maintenance, repairs, or replacement of defective material. The permanent pavement disturbance limits demonstrated on the contract documents are the maximum Limits indicated. It should be noted that the payment for permanent pavement will be made based on the quantity measured in the Field. There will be no additional payment for pavement disturbance beyond the maximum Limit unless previous approval is granted by the engineer or the Brookfield WPCA representatives in writing.

Where the sawcut line is less than 24" from the edge of existing pavement the contractor shall replace the concrete to the edge of existing concrete. The additional area shall be included in the unit price bid for the pavement restoration. Refer to contract documents for additional milling and paving limits.

Section 33.04 BASIS OF PAYMENT

The unit price bid for this item shall be full payment for furnishing all labor, equipment and materials, necessary to complete the concrete restoration as shown on the drawings and specified herein.

**CONTRACT ITEM 34
STAMPED BITUMINOUS CONCRETE CROSSWALK RESTORATION**

Sect. 34.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, materials, and equipment necessary to replace the stamped bituminous concrete crosswalk in accordance with the plans and specifications. All work associated with this item shall be performed in accordance with CTDOT specifications

Sect. 34.02 GENERAL REQUIREMENTS

Work under this Item, shall conform to the following General Specifications:

Sect. S-08 - Restoration of Surfaces

Section 34.03 METHOD OF MEASUREMENT

This work will be measured by the number of square feet of bituminous concrete limits in place. No measurement will be made for maintenance, repairs, or replacement of defective material. The permanent pavement disturbance limits demonstrated on the contract documents are the maximum Limits indicated. It should be noted that the payment for permanent pavement will be made based on the quantity measured in the Field. There will be no additional payment for pavement disturbance beyond the maximum Limit unless previous approval is granted by the engineer or the Brookfield WPCA representatives in writing.

Section 34.04 BASIS OF PAYMENT

The unit price bid for this item shall be full payment for furnishing all labor, equipment and materials, necessary to complete the bituminous stamped concrete restoration as shown on the drawings and specified herein.

**CONTRACT ITEM 35
PAVEMENT MARKING RESTORATION**

Sect. 35.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, materials, and equipment necessary to place all pavement markings disturbed because of this project. All pavement markings shall be restored in accordance with CTDOT specifications.

Sect. 35.02 GENERAL REQUIREMENTS

Not Used

Section 35.03 METHOD OF MEASUREMENT

This work will be measured as a single Lump Sum item. No measurement will be made for maintenance, repairs, or replacement of defective material.

Section 35.04 BASIS OF PAYMENT

The unit price bid for this item shall be full payment for furnishing all labor, equipment and materials, required to restore the pavement markings to their original condition.

**CONTRACT ITEM 36
FLAGSTONE WALK RESTORATION**

Sect. 36.01 DESCRIPTION

Under this item, the Contractor shall furnish all labor, materials, and equipment necessary to restore the existing flagstone walk to its original condition. The existing flagstones shall be preserved and reuse to the extent practical.

Sect. 36.02 GENERAL REQUIREMENTS

Not Used

Section 36.03 METHOD OF MEASUREMENT

This work will be measured as a single Lump Sum item. No measurement will be made for maintenance, repairs, or replacement of defective material.

Section 36.04 BASIS OF PAYMENT

The unit price bid for this item shall be full payment for furnishing all labor, equipment and materials, required to restore the pavement markings to their original condition. This includes any supplemental flagstones that may be required to complete the walkway restoration.